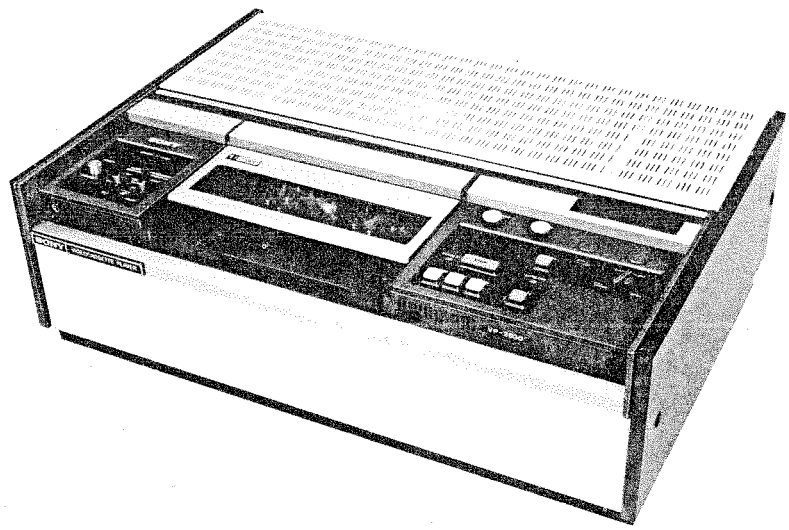
U-matic

VIDEOCASSETTE PLAYER

VP-2031



SONY®

SERVICE MANUAL

SPECIFICATIONS

GENERAL

Video recording system: Rotary two-head helical scanning
Luminance: fm recording
Colour signal: converted subcarrier direct recording

Video signal system: CCIR standards, PAL/SECAM colour signal, NTSC (modified) colour signal

Storage temperature: –20°C to 60°C (–4°F to 140°F)

Operating temperature: 5°C to 40°C (41°F to 104°F)

RF output signal: Selected operating channel of the RF unit, standard asymmetrical aerial connecting socket

Power requirements: 100, 110, 120, 127, 220, or 240V ac ± 10% (selectable)
50 or 60Hz ± 0.5%

Power consumption: 120W

Power output: 6.8V max. 0.6Adc (REMOTE connector pin-1)

Weight: approximately 30kg (66lb 2 oz)

Dimensions: approximately 591 x 224 x 416mm ($23^1/4$ x $8^7/8$ x $16^3/8$ inches) (w/h/d)

VIDEO

Output: 1.0Vp-p ± 0.2Vp-p, 75 ohms, unbalanced, sync negative
LINE; BNC connector
TV; 8-pin connector

Horizontal resolution: Monochrome: 300 lines
Colour: 250 lines

Signal-to-noise ratio: Monochrome: better than 48dB
Colour: better than 45dB

AUDIO

Output: **LINE:** –5dB (100kohm load), unbalanced, phono jack
MONITOR: –5dB (100kohm load) unbalanced, minijack
TV: –5dB (100kohm load), unbalanced, 8-pin connector
HEADPHONES: 8ohms, phone jack

Frequency response: 50 to 12000Hz

Signal-to-noise ratio: Better than 45dB (both channels, 3% distortion level at 1kHz)

TAPE TRANSPORT

Tape speed: 9.53cm/sec. ($3^3/4$ ips)

Wow and flutter: Less than 0.2% rms

playback time: 60 min. (for Sony KCA-60)
30 min. (for Sony KCA-30)

Fast forward time: Within 6min. (for Sony KCA-60)

Rewind time: Within 4min. (for Sony KCA-60)

SPECIAL FUNCTIONS

Pause mode: A still picture is displayed (released automatically in 7 to 10 minutes)

Timer operation: Possible (with an optional timer recording adaptor)

Remote control: Possible (with Sony model RM-420 or RM-410 remote control)

ACCESSORIES SUPPLIED

AC mains lead
Dust cover
(Only for the "E" model
RFU-250UCE, RF modulator
75-ohm coaxial aerial connection cable
ANS-30, antenna selector
8-pin connecting cable)

OPTIONAL ACCESSORIES

Remote control RM-420
Remote control RM-410
Dubbing cable VDC-5
RF modulator: RFU-220 series or RFU-250 series
Antenna selector ANS-31
Timer recording adaptor FA-20
Cleaning cassette KC-1C
Auto search control RX-353CE, RX-303CE, RM-300

TABLE OF CONTENTS

1. CAUTIONS AND OTHER INFORMATION

1-1. Location of Parts and Controls 1-1
1-2. RF Modulator Installation 1-2
1-3. Playback Using a Professional Video Monitor . . . 1-3
1-4. Playback Using a Regular TV 1-4
1-5. Duplicating a Video Tape 1-5
1-6. Timer Playback 1-6
1-7. FA-20 Installation 1-6
1-8. Disassembly of Cabinet 1-7
1-9. Spare Parts 1-8
1-10. Alignment Tape 1-8
1-11. Monitor TV 1-9
1-12. Adaptation to Your Mains Supply 1-9
1-13. To Remove the Cassette Compartment Manually 1-9
1-14. To Operate the Machine without Installing Cassette 1-10
1-15. Power Line Frequency Change 1-10
1-16. Notes for Mechanical Alignment 1-11
1-17. Notes for Electrical Alignment 1-11
1-18. Jigs Reguired for Alignment 1-12

2. PERIODIC CHECK AND MAINTENANCE

2-1. Check Procedure After Completion of Machine Repair Work 2-1
2-2. Periodic Check and Maintenance 2-1
2-3. Others 2-3

3. REPLACEMENT OF MAJOR PARTS

3-1. Replacement of Upper Drum Ass'y (including eccentricity adj.) 3-1
3-2. Replacement of Drum Unit 3-2
3-3. Replacement of AC Motor 3-3
3-4. Replacement of Threading DC Motor 3-3
3-5. Replacement of Audio/CTL Head 3-4
3-6. Replacement of Full Erase Head 3-4
3-7. Replacement of CTL PB Head 3-4

4. LINK AND DRIVE SYSTEM ALIGNMENT

4-1. Reel Table Adjustment 4-1
4-1-1. Take-up Reel Table, Height Adj. 4-1
4-1-2. Supply Reel Table, Height Adj. 4-2
4-2. Solenoid System Adjustment 4-2
4-2-1. Main Solenoid Adj. 4-2
4-2-2. Idler Solenoid Adj. 4-3
4-2-3. Function Solenoid Position Adj. 4-3
4-3. Threading Arm Adjustment 4-3
4-3-1. Margin Gear Position Adj. 4-3
4-3-2. Threading Arm Stopper Position Adj. 4-4
4-3-3. FR Unthread-End Switch Position Adj. 4-5
4-4. Brake System Adjustment 4-6
4-4-1. S.Hold Lever Position Adj. 4-6
4-4-2. Supply Reel Table, Brake Torque Adj. 4-7
4-4-3. Take-up Reel Table, Brake Torque Adj. 4-7
4-4-4. Supply Brake Release Adj. 4-8
4-5. Tension Regulator Position Adjustment 4-8
4-5-1. Supply Tension Regulator Position Adj. (FWD Mode) 4-8
4-5-2. Take-up Tension Regulator Operating Position Adj. 4-8
4-5-3. R.Tension Regulator Position Adj. 4-9
4-5-4. Supply Tension Regulator Stopper Position Adj. 4-9
4-5-5. Supply Tension Regulator Position Adj. (REW Mode) 4-10
4-5-6. Supply Tension Regulator Pin Movable Range Adj. (FF Mode) 4-11
4-6. Tape Threading System Adjustment 4-11
4-6-1. Threading Ring Rotation Adj. 4-11
4-6-2. Gear Box Positiin Adj. 4-11
4-7. Switch System Adjustment 4-12
4-7-1. AC Motor Switch Position Adj. 4-12
4-7-2. Cassette-up Switch Position Adj. 4-13
4-8. Still-adjust Adjustment 4-13
4-8-1. ST Cam Position Adj. 4-13
4-8-2. Roller Stopper Position Adj. 4-14
4-8-3. Roller Stopper Stroke Adj. 4-14

5. BACK TENSION AND TORQUE ALIGNMENT

5-1. Threading Back Tension Adjustment 5-1
5-2. Forward Mode, Tape Hold-Back Tension Adj. . 5-1
5-3. Rewind Mode, Tape Hold-Back Tension Adj. . 5-2
5-4. Fast-Forward Mode, Tape Hold-Back Tension Adj. 5-2
5-5. Forward Torque Check (Take-up Reel Table) . . 5-3
5-6. Overall Forward Take-up Torque Check 5-3
5-7. Rewind Torque Adjustment 5-4
5-8. Fast-Forward Torque Check 5-4

6. TAPE RUN ALIGNMENT

6-1. Pinch Roller Stopper Position Adjustment . . 6-1
6-2. Pinch Lever Right Angle Adjustment 6-1
6-3. Pinch Roller Self-Alignment Adjustment 6-1
6-4. Pinch Roller Slant Angle Adjustment 6-2
6-5. Fast-Forward and Rewind Modes Tape Run Adj. 6-4
6-6. Forward Mode Tape Run Adjustment 6-5
6-7. Tape Advancing Power Adjustment 6-6
6-8. Tracking Adjustment 6-7
6-8-1. Tape Path Adjustment 6-7
6-8-2. Audio Head Height Adjustment 6-8
6-8-3. Audio Azimuth/Phase Adjustment 6-8
6-8-4. Audio/CTL Head Position Adjustment 6-9
6-8-5. CTL PB Head Height Adj. 6-10
6-8-6. Switching Position Adjustment 6-10
6-9. Unthread Slack Switch Position Adjustment . . 6-11
6-10. Video Head Dihedral Adjustment 6-11
6-11. Tape Speed Adjustment 6-12

7. POWER SUPPLY ALIGNMENT

7-1. REG 12V Adj. 7-1
7-2. REG 24V Adj. 7-1
7-3. REG 6.8V Adj. 7-1

8. SERVO SYSTEM ALIGNMENT

8-1. Tape Speed Adj. 8-1
8-2. V Blanking Pulse Width Adj. 8-1
8-3. Drun Free Speed Adj. (PAL/SECAM) 8-1
8-4. Drum Free Speed Adj. (NTSC) 8-2
8-5. TRACKING CONTROL Variable Range Calib. . 8-2
8-6. TRACKING CONTROL Calib. (PAL/SECAM) . . 8-2
8-7. TRACKING CONTROL Calib. (NTSC) 8-2
8-8. Switching Position Adj. 8-3
8-9. Still VD Position Adj. 8-3

9. AUDIO SYSTEM ALIGNMENT

9-1. Audio Head Height Adj. 9-2
9-2. Audio Azimuth/Phase Adj. 9-2
9-3. Audio/CTL Head Position Adj. 9-2
9-4. Playback Level Adj. 9-2
9-5. Playback Freq. Response Adj. 9-2

10. VIDEO SYSTEM ALIGNMENT

10-1. Playback RF Amplifer Alignment 10-3
10-1-1. Playback RF Freq. Response Adj. 10-3
10-1-2. Playback Y-RF Output Balance Adj. 10-4
10-1-3. Playback Y-RF Output Level Adj. 10-4
10-1-4. Playback Chroma-RF Output Balance Adj. 10-4
10-1-5. Playback Chroma-RF Output Level Adj. 10-4
10-1-6. Drop-out Compensator Sensitivity Adj. 10-5

10-2. Y-Demodulator Alignment 10-5
10-2-1. Y-Demodulator's Limiter Balance Adj. 10-5
10-2-2. Y-Freq. Response Adj. 10-6
10-2-3. Y-Output Level Adj. 10-6

10-3. Playback Chroma Alignment 10-7
10-3-1. APC Burst Flag Phase/Width Adj. 10-7
10-3-2. Playback ACC Burst Flag Phase Adj. 10-7
10-3-3. 5.12 MHz Turning Adj. 10-7
10-3-4. 4.43 MHz Freq. Converter Balance Adj. 10-8
10-3-5. Playback ACC Burst Turning Adj. 10-8
10-3-6. APC Gain Adj. 10-8
10-3-7. Playback Colour Killer Adj. 10-9
10-3-8. 4.43 MHz Ref. Osc. Freq. Adj. 10-10
10-3-9. AFC VCO Freq. Adj. 10-10
10-3-10. 3.58 MHz Local Osc. Freq. Adj. 10-10
10-3-11. APC VCO Freq. Adj. 10-10
10-3-12. Colour Lock Control Calib. 10-11
10-3-13. Chroma Output Level Adj. 10-11
10-3-14. Dub Chroma Output Level Adj. 10-11

10-4. SECAM Signal Detector FH/2 Turning 10-12

11. BLOCK DIAGRAMS

Overall Block Diagram 11-1
Y/C PB Amplifier Block Diagram 11-3
Y/C Demodulator Block Diagram 11-5
Servo System Block Diagram 11-7
Audio System Block Diagram 11-9

12. PRINTED WIRING BOARDS AND SCHEMATIC DIAGRAMS

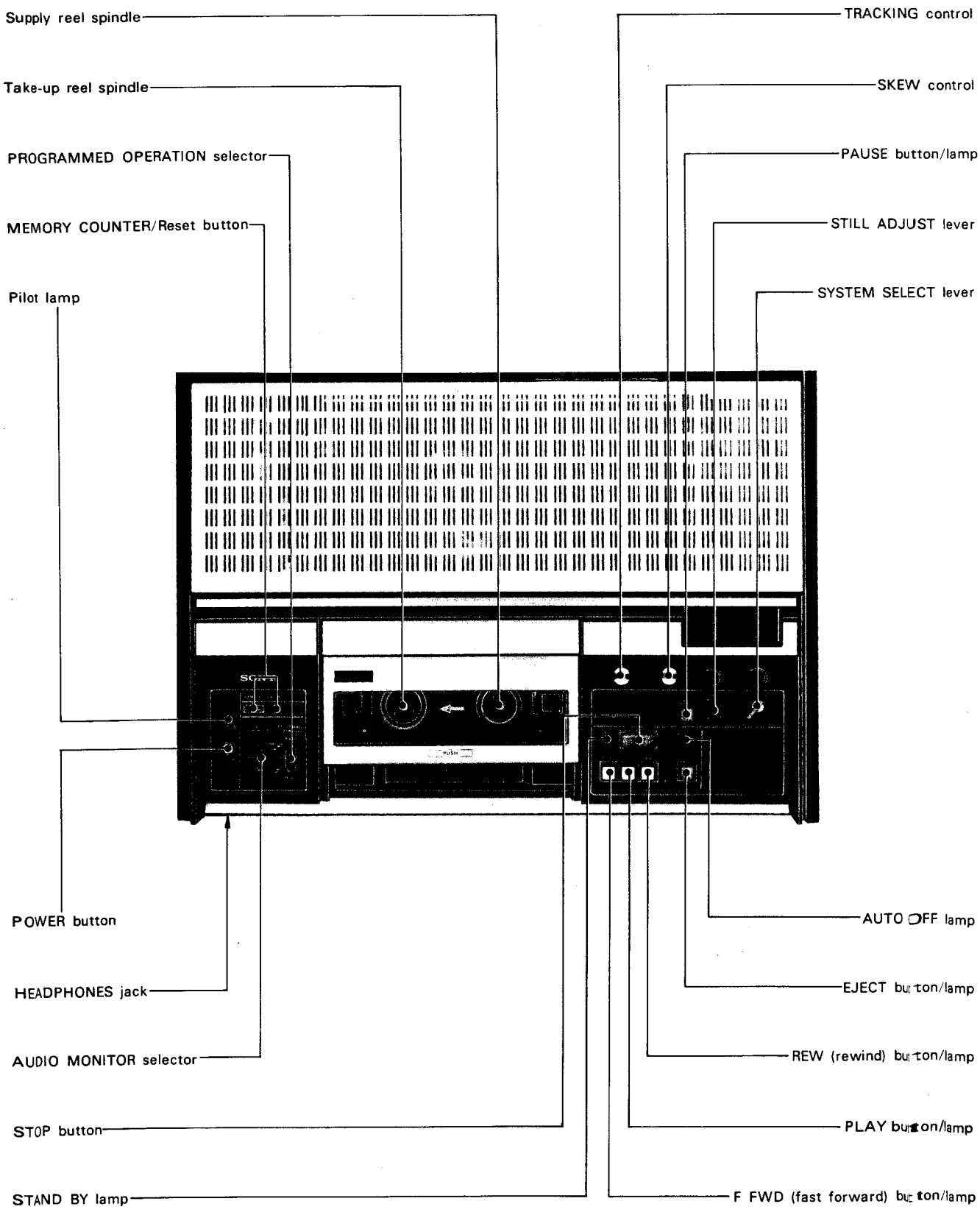
IC 12-1
MAIN PARTS LOCATION 12-3
VIDEO
RP-2A 12-5
HF-3 12-5
DM-8 12-10
AUDIO
AP-1A, SA-1 12-15
SERVO
SV-10A, RL-5 12-20
POWER SUPPLY
PW-30, SI-4 12-25
SYSTEM CONTROL
SY-46 12-29
FRAME WIRING 12-36
AH-3, DM-3 12-39
EC-17, FR-9 12-40
KY-10 12-41
PR-17, RL-7 12-42
SC-20 12-43
SL-3 12-44

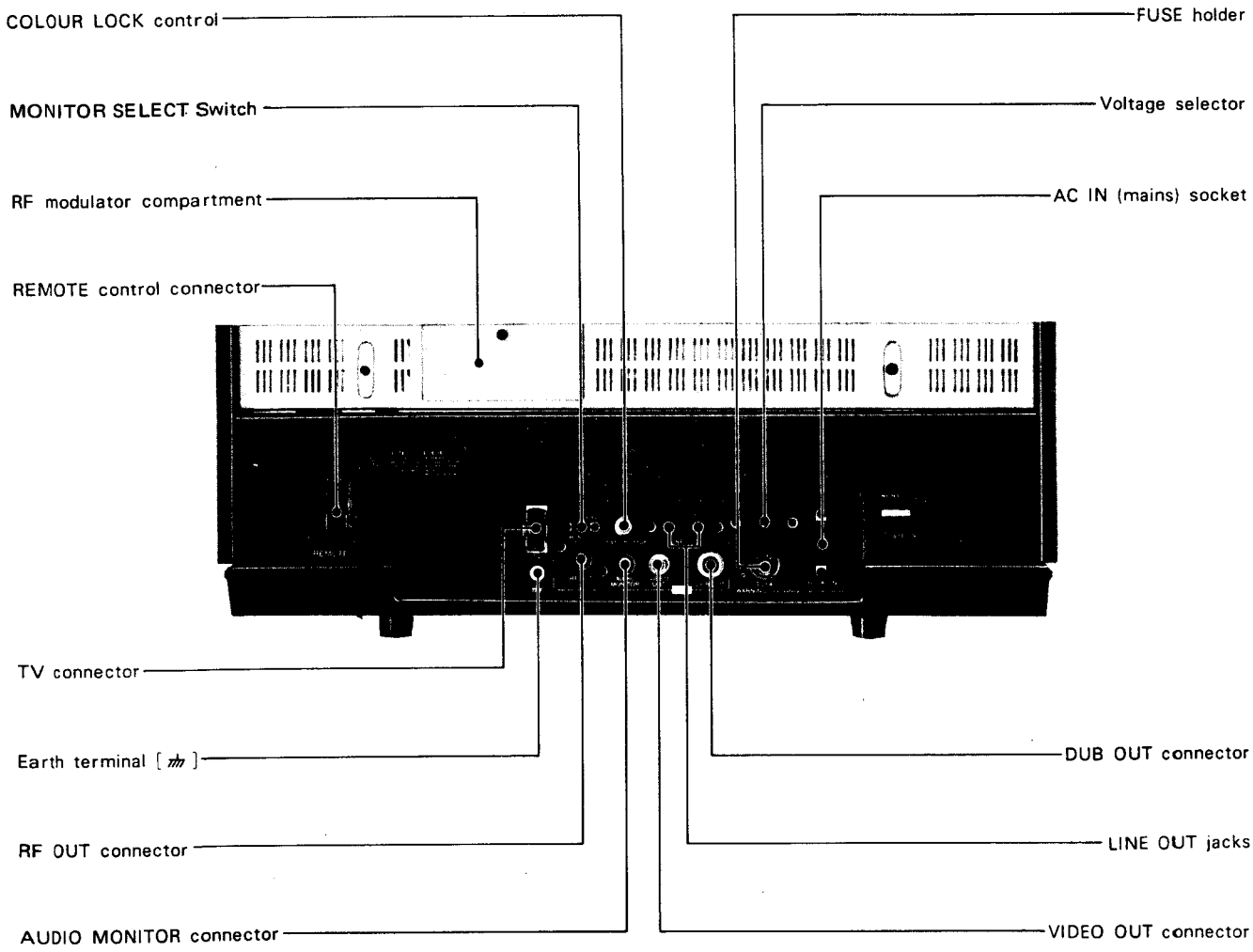
13. SPARE PARTS AND JIG

13-1. Parts Information 13-1
13-2. Exploded View
Cabinet Block 13-2
Right Side Block 13-3
Left Side Block 13-4
Connector Parel Block 13-5
Link Block
Take-up side 13-6
Supply side 13-7
Tape Threading Block
Threading ring 13-8
Threading arm 13-9
Pinch Lever Block 13-10
Mechanical Link and Cassette-up Block 13-11
Head Drum and Slant Base Block 13-12
Erase Head Block 13-13
Motor Block 13-14
Function Block 13-15
Function Button Block 13-16
Chassis Block (bottom view)
Driving system 13-17
Micro switch block 13-18
Printed circuit boards 13-19
13-3. Electric Parts List 13-20
Parts arranged in their printed wiring board's alphanumeric order 13-25
Frame 13-36
13-4. Packing Material and Accessory 13-38
13-5. Jig 13-38

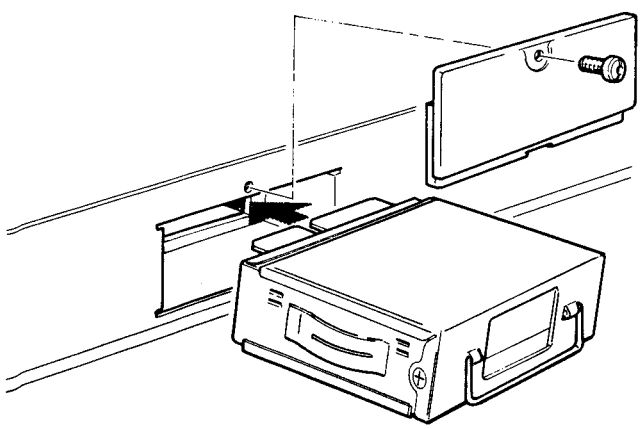
SECTION 1
CAUTIONS AND OTHER INFORMATION

1-1. LOCATION OF PARTS AND CONTROLS





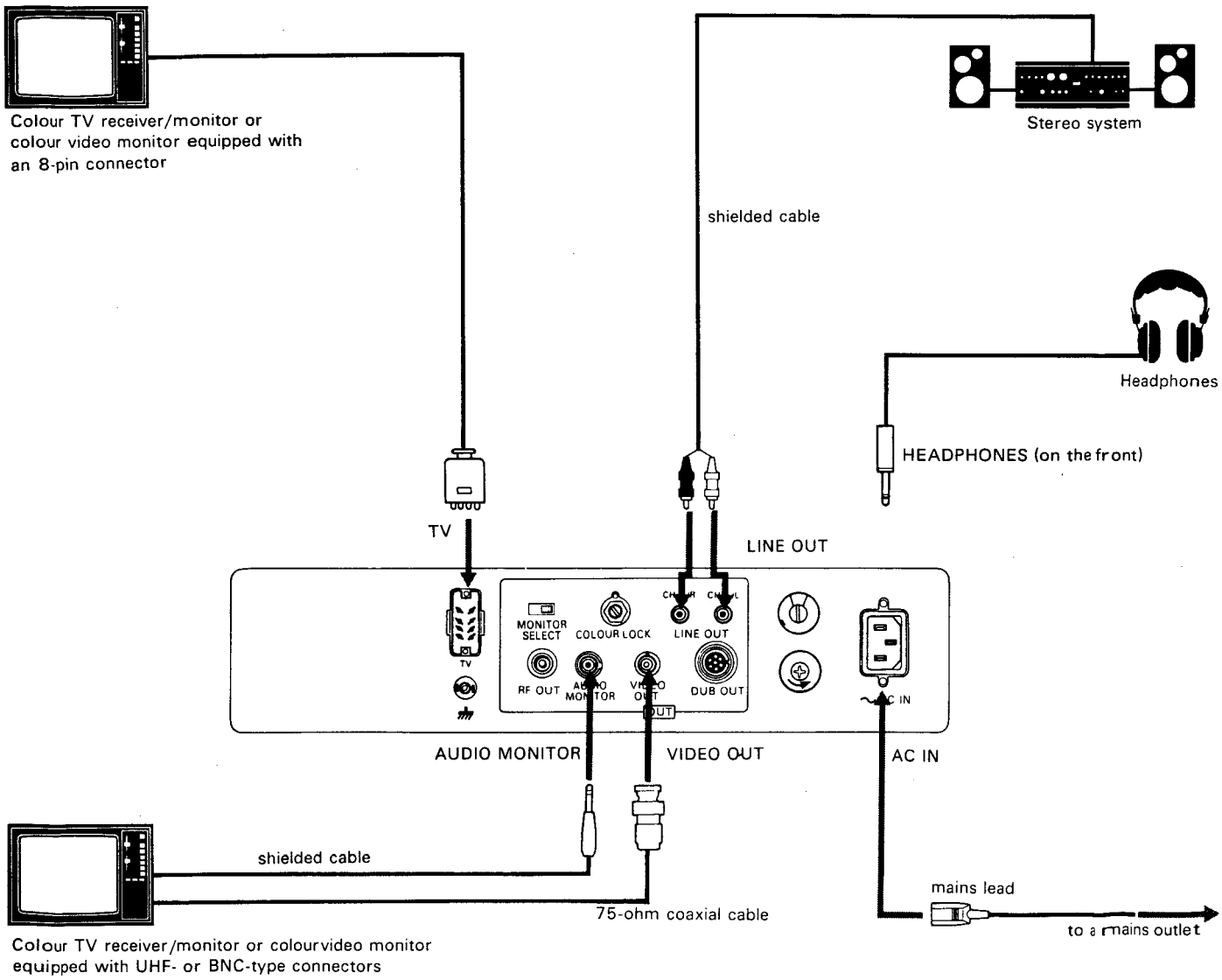
1-2. RF MODULATOR INSTALLATION



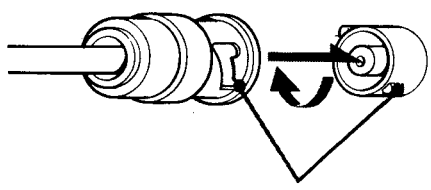
Notes

- When the RF modulator (optional) is not installed, no output signal will be available from the RF OUT connector.
- When the player is not in use and the TV set is to be used as a normal television set, set the aerial selector to ANT.

1-3. PLAYBACK USING A PROFESSIONAL VIDEO MONITOR

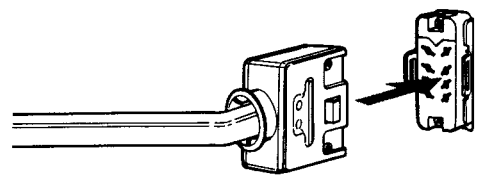


BNC connector



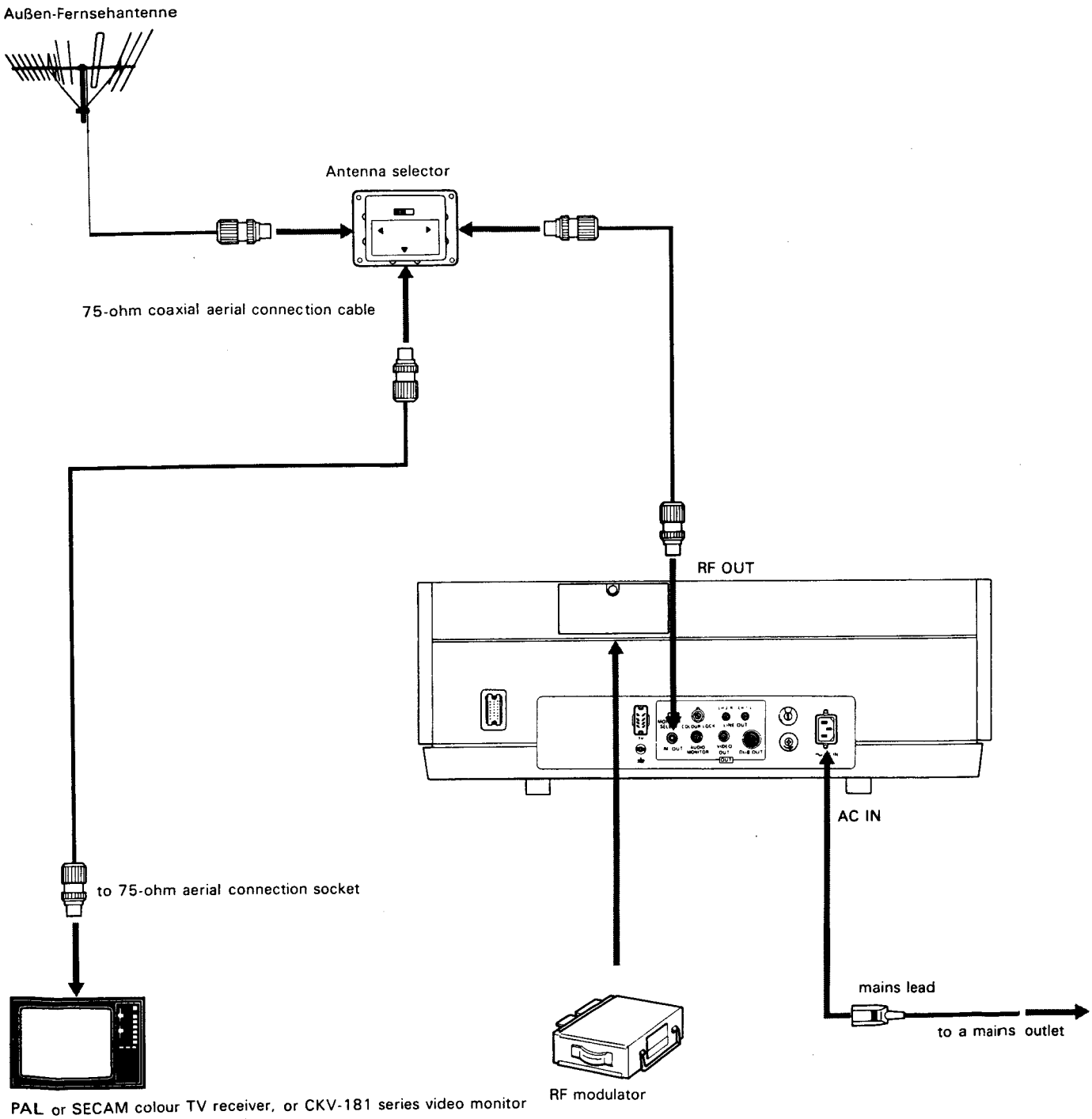
Insert by engaging the slot with the projection and tighten the knurled locking ring clockwise.

8-pin connector

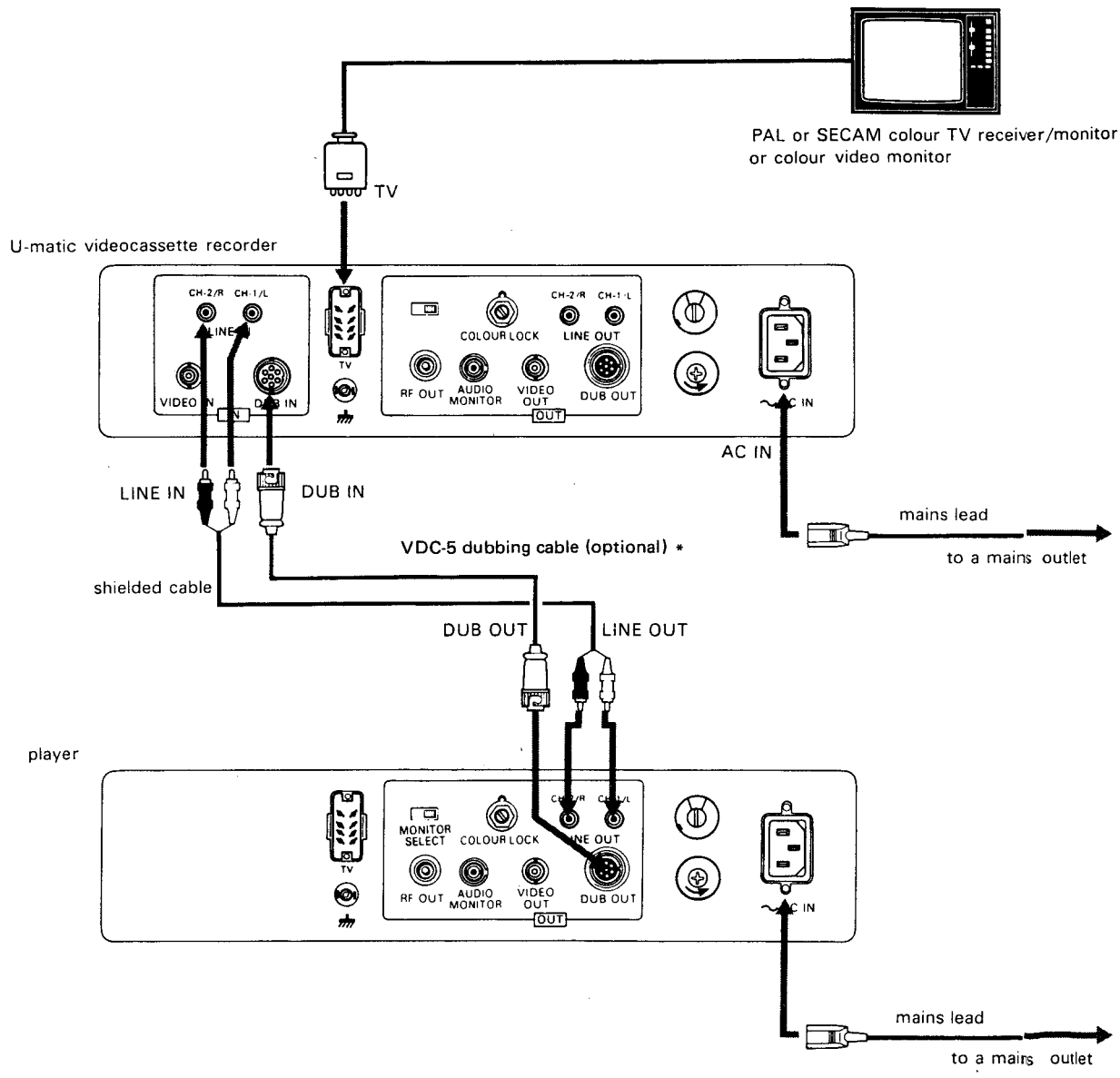


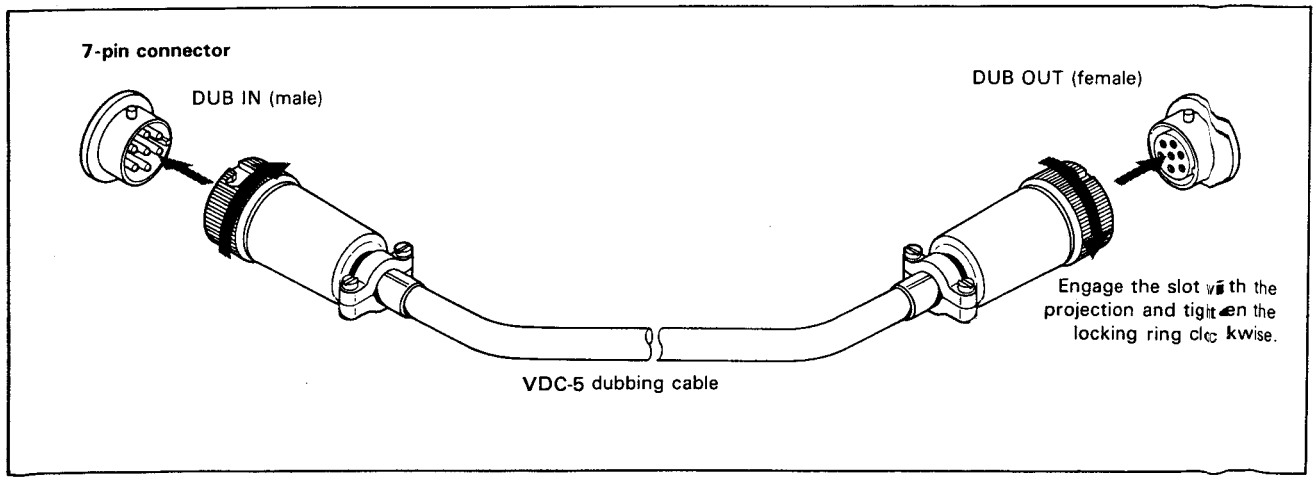
When connecting the cable, observe the direction. To remove, press the buttons on the connector.

1-4. PLAYBACK USING A REGULAR TV RECEIVER

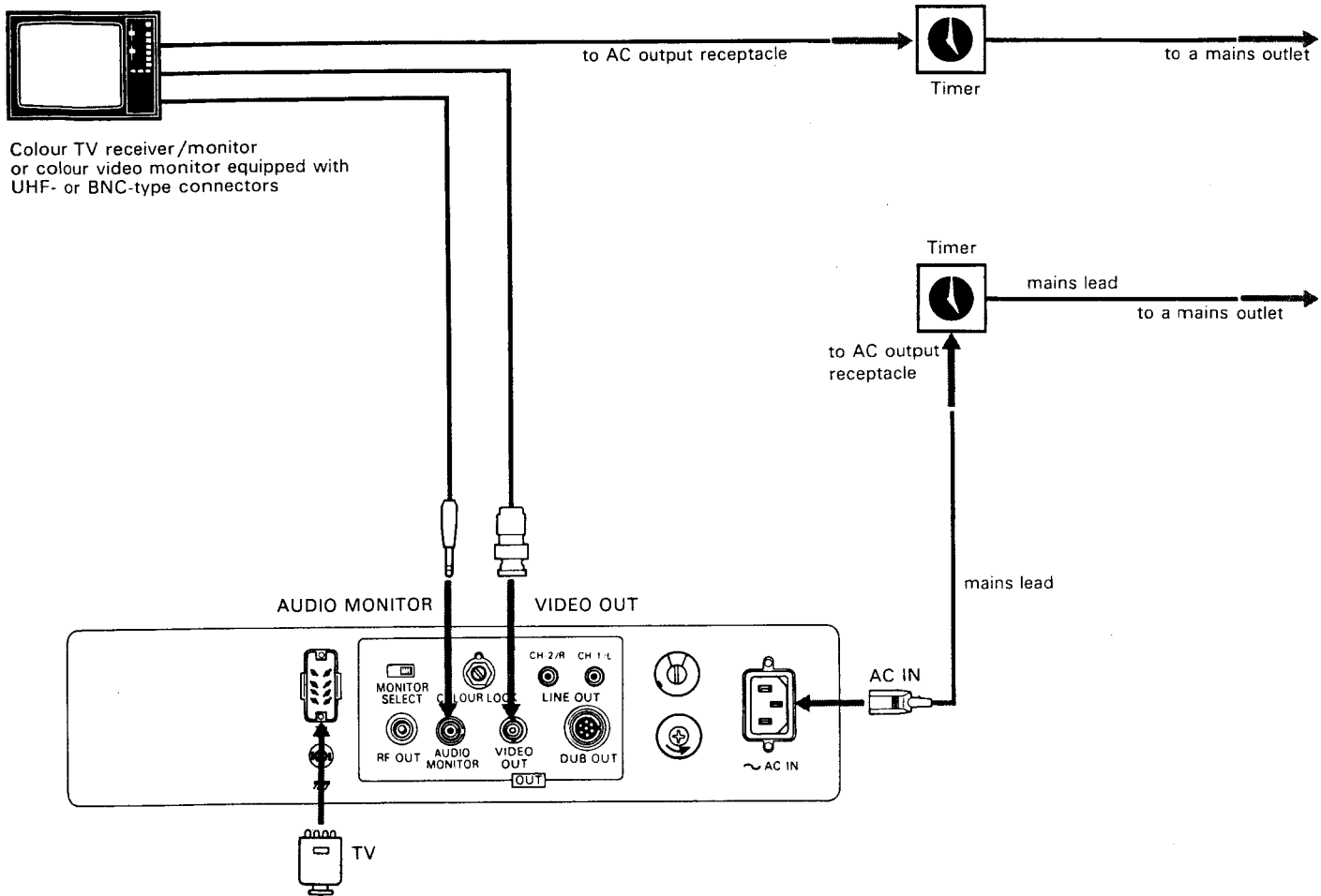

Außen-Fernsehantenne
Antenna selector
75-ohm coaxial aerial connection cable
RF OUT
AC IN
to 75-ohm aerial connection socket
mains lead
to a mains outlet
RF modulator
PAL or SECAM colour TV receiver, or CKV-181 series video monitor for playback of NTSC-recorded tapes

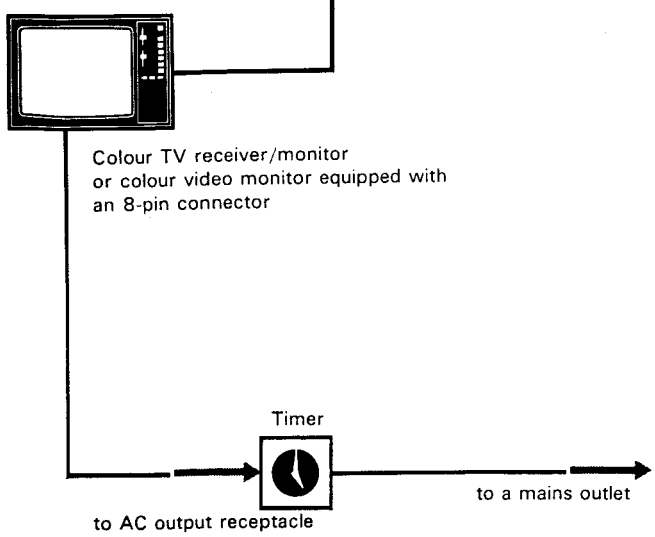
1-5. DUPLICATING A VIDEO TAPE



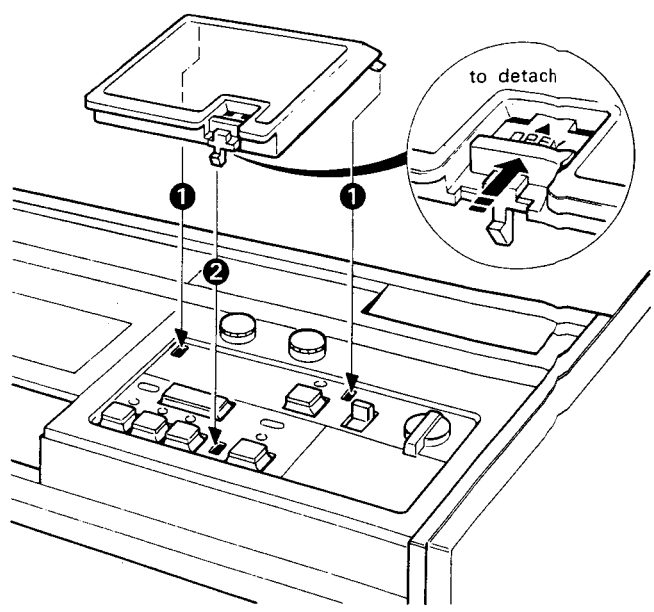

7-pin connector
DUB IN (male)
DUB OUT (female)
Engage the slot with the projection and tighten the locking ring clockwise.
VDC-5 dubbing cable

1-6. TIMER PLAYBACK

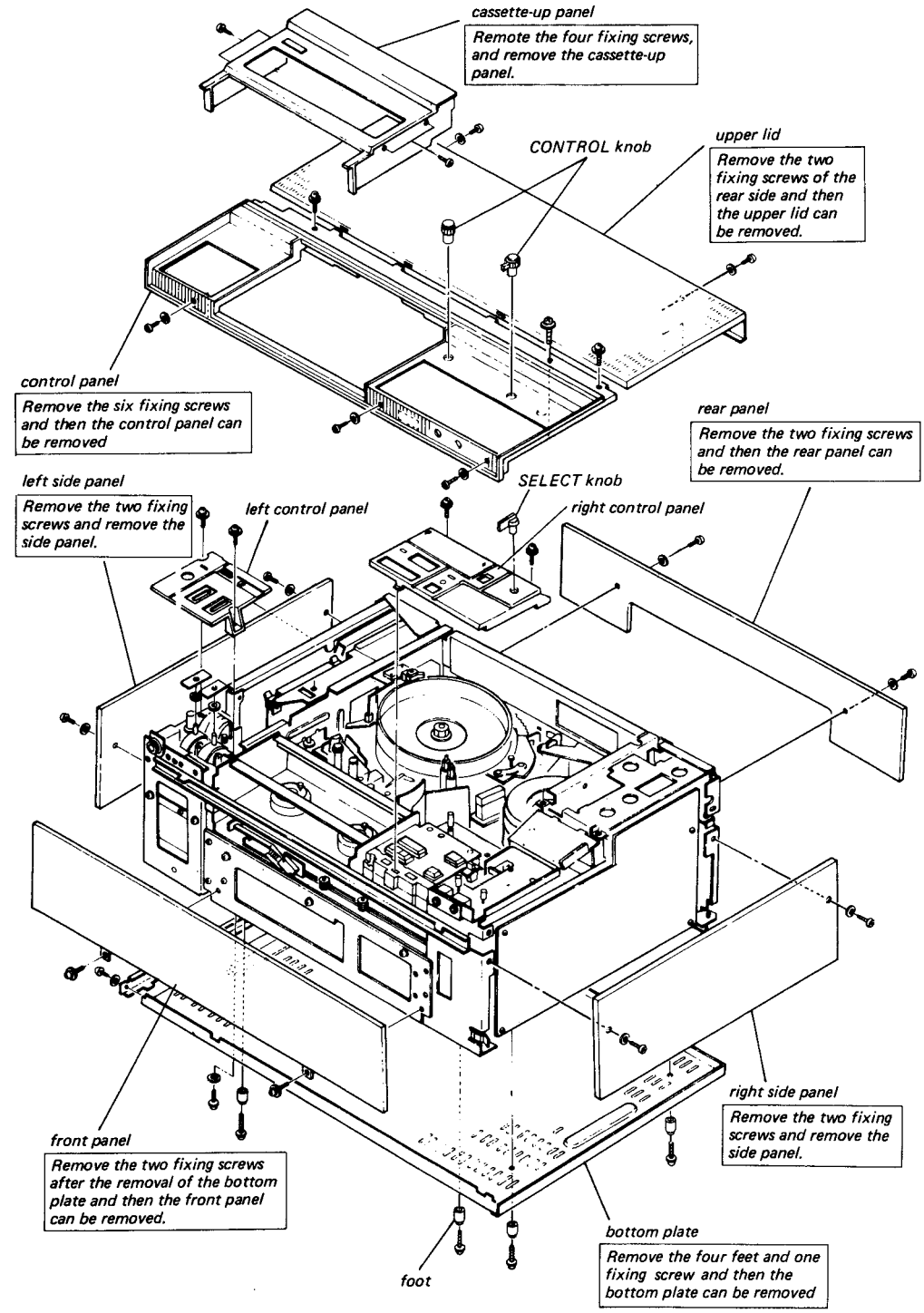




1-7. FA-20 INSTALLATION



1-8. DISASSEMBLY OF CABINET


cassette-up panel
Remote the four fixing screws, and remove the cassette-up panel.
CONTROL knob
upper lid
Remove the two fixing screws of the rear side and then the upper lid can be removed.
control panel
Remove the six fixing screws and then the control panel can be removed
rear panel
Remove the two fixing screws and then the rear panel can be removed.
left side panel
Remove the two fixing screws and remove the side panel.
left control panel
SELECT knob
right control panel
right side panel
Remove the two fixing screws and remove the side panel.
front panel
Remove the two fixing screws after the removal of the bottom plate and then the front panel can be removed.
bottom plate
Remove the four feet and one fixing screw and then the bottom plate can be removed
foot

1-9. SPARE PARTS

1-9-1. Safety Related Component Warning

Components identified by shading marked with ⚠ on the schematic diagrams, exploded views and electrical spare parts list are critical to safe operation. Replace these components with Sony parts whose parts numbers appear as shown in this manual or in service bulletins and service manual supplements published by Sony.

1-9-2.

Replacement Parts supplied from Sony Parts Center will sometimes have different shape and outside view from the parts which actually in use. This is due to "accommodating the improved parts and/or engineering changes" or "standardization of genuine parts."

This manual's exploded views and electrical spare parts list are indicating the parts numbers of "the standardized genuine parts at present".

Regarding engineering parts changes in our engineering department, refer Sony service bulletins and service manual supplements.

1-9-3.

Printed Components in Bold-Face type on the exploded views and electrical spare parts list are normally stocked for replacement purposes. The remaining parts are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.

1-10. ALIGNMENT TAPE

Playback performance of the VP-2031 can be checked and adjusted by using any of the PAL, SECAM, or NTSC format alignment tape.

It is recommended to adjust the machine with the PAL or SECAM format alignment tape.

If the PAL or SECAM format alignment tape is not available by all means while the NTSC format alignment tape is on hand, adjust the machine by following the adjustment procedure under the NTSC column.

(i) The PAL alignment tape is required for the function check and adjustment in the PAL system;

- type RR5-1S, PAL (SONY Part No. 8-960-015-61).

Video	Audio	Time
Monoscope Signal	3kHz, 0dB	5 min.
PAL Colour-bar signal (75%)	3kHz, 0dB	5 min.
R-F Sweep signal	3kHz, 0dB	5 min.
Control Signal only	1kHz, 0dB	2.5min.
Control Signal only	10kHz, −10dB	2.5min.

(ii) The SECAM alignment tape is required for the function check and adjustment in the SECAM system;

- type RR5-1S, PAL (SONY Part No. 8-960-015-61) (Pal system colour-bar recorded on this tape is not utilized for the adjustment.)
- type RR4-7S, SECAM Colour-bar (SONY Part No. 8-960-014-87)

Video	Audio	Time
SECAM Colour-bar Signal	No signal	15 min.

(iii) The NTSC alignment tape is required for the function check and adjustment in the case of the NTSC system;

- type RR5-1S (SONY Part No. 8-960-015-01)

Video	Audio	Time
Monoscope Signal	3kHz, 0dB	5 min.
NTSC Colour-bar Signal (75%)	3kHz, 0dB	5 min.
R-F Sweep Signal	3kHz, 0dB	5 min.
Control Signal only	1kHz, 0dB	2.5 min.
Control Signal only	10kHz, −10dB	2.5 min.

1-11. MONITOR TV

The monitor TV to be connected to the VP-2031 must be the one which conforms to the signal system inputted to the machine or a signal system recorded on a tape to be played back.

SELECTION OF MONITOR

Signal standard	Operation	Monitor (Ex.)
PAL colour	off-the-air recording (when a separate tuner is used, refer to the next column)	PAL receiver/monitor such as: Sony CVM-1310 series, or Sony CVM-1810 series which has an appropriate tuner for your local TV broadcasts.
	other recording and playback	Same as above, plus PAL video monitor such as Sony PVM-1300E (with PAL board) and PAL TV receiver (with an appropriate RF unit)
SECAM colour	off-the-air recording (when a separate tuner is used, refer to the next column)	SECAM receiver/monitor such as: Sony CVM-1830SE which has an appropriate tuner for your local TV broadcasts
	other recording and playback	Same as above plus SECAM video monitor such as: Sony PVM-1300E (with SECAM board) and SECAM TV receiver (with an appropriate RF unit)
NTSC colour	playback only	Special Sony monitor which accepts the modified NTSC* signal, such as: CVM-1310 series, CVM-1810 series and CKV-181 series. *Regular NTSC monitors do not reproduce proper colour.
625 line/50 field monochrome	record/playback	625line/50field monochrome monitor
525line/60field monochrome	playback	525line/60field monochrome monitor

TRI-MODE MONITOR

PVM-1850PS
PVM-2750PS

These monitor can reproduce PAL, SECAM and modified NTSC colour.

1-12. ADAPTATION TO YOUR MAINS SUPPLY

This machine operates on either 100, 110, 120, 127, 220 or 240Vac.

Before connecting the set to a mains outlet, check that the operating voltage is identical with the voltage of your mains supply.

To reset the voltage, turn the Voltage selector screw with a coin or similar device until the correct voltage figure appears at the cutout.

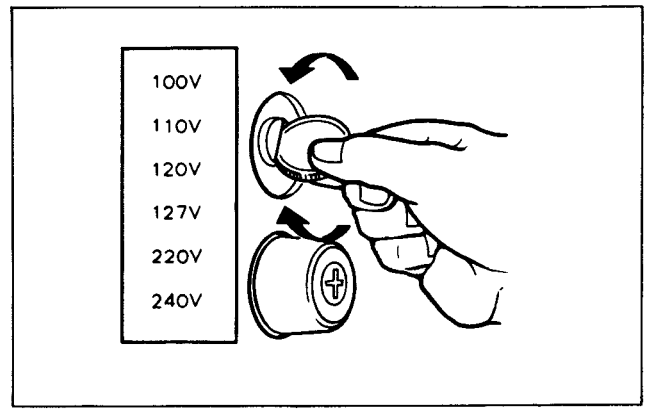


Fig. 1-2. Adaptation to your mains supply

1-13. TO REMOVE THE CASSETTE COMPARTMENT MANUALLY

Normally the cassette compartment must be lifted with the EJECT button. However, if the cassette compartment cannot be lifted with the EJECT button when the power is turned on, or if you want to lift up the cassette compartment where the power is not available, you may lift it up manually as follows.

(i) Insert a small screwdriver or the like into the slot located at the center of the cassette compartment.

(ii) When the tip of the screwdriver touches bottom, slide it to the right. The compartment will pop up.

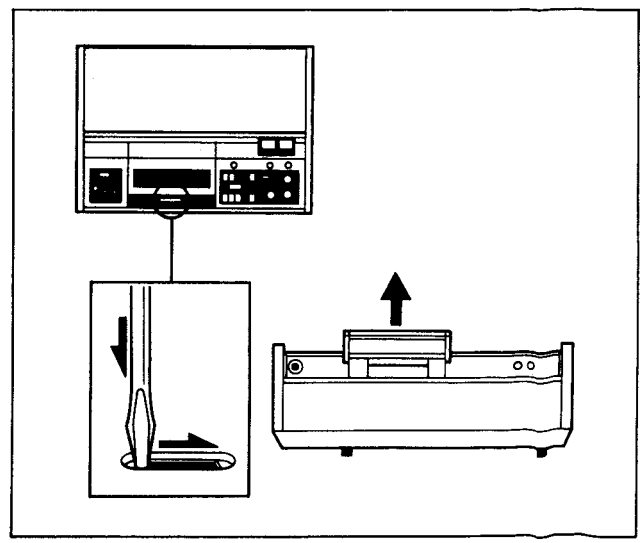
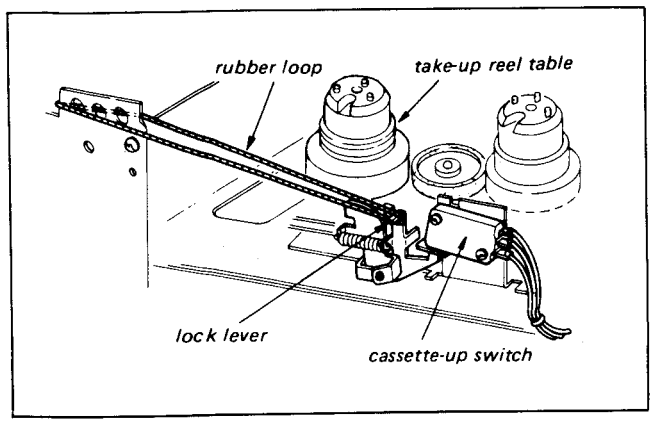


Fig. 1-3. To remove the cassette compartment manually

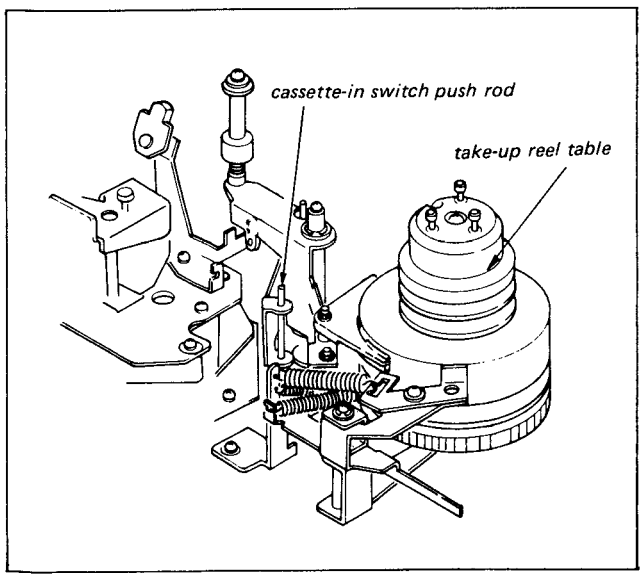
1-14. TO OPERATE THE MACHINE WITHOUT INSTALLING CASSETTE

1-14-1. Setting up FR-STOP Mode from EJECT Mode

1. Cut a piece of black plastic insulation tape into a piece 1 ~ 2 cm long and place it over the two photo transistors in order to stop the end sensor circuit.
2. Hook the cassette compartment lock lever of the cassette-up switch block as shown below with a rubber loop on the front of the chassis, putting the cassette-up switch in ON position (the same position as the cassette-up assembly is lowered).



3. Keep pressing down the cassette-in switch push rod, until the threading ring stops its rotation.
Thus the FR-STOP mode is set up.

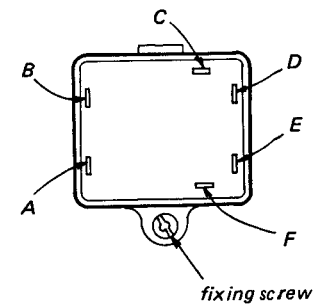
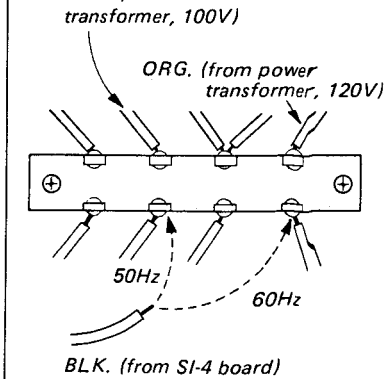


1-14-2. Setting up PLAY Mode from FR-STOP Mode

1. Remove CN-2 connector on the FR-9 board at the back of the left side plate in order to stop the unthread slack switch operation.
2. Press the PLAY button.
3. Push the cassette-in switch push rod until the pinch roller presses on the capstan shaft. Now the PLAY mode is set up.

1-15. POWER LINE FREQUENCY CHANGE

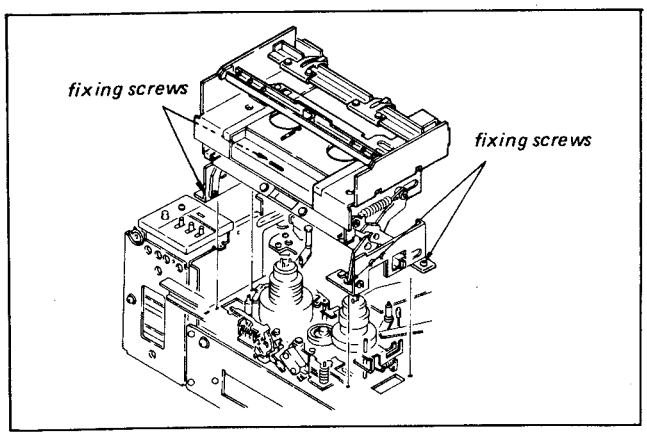
The following five items of replacements and changes are necessary for the power line frequency change.

Description	60 Hz		50 Hz	
	Parts No.	Mark	Parts No.	Mark
(1) Replacement of motor pulley (thread the pulley to the AC motor stopper)	3-655-431-01	01	3-655-433-01	01
	3-655-431-11	11	3-655-433-11	11
	3-655-431-21	21	3-655-433-21	21
	3-655-431-31	31	3-655-433-31	31
	3-655-431-41	41	3-655-433-41	41
	3-655-431-51	51	3-655-433-51	51
	3-655-431-61	61	3-655-433-61	61
	3-655-431-71	71	3-655-433-71	71
	3-655-431-81	81	3-655-433-81	81
	3-655-431-91	91		
(2) Wiring change of MP capacitor	(terminal) (wire colour) A ⟷ BLK. B ⟷ BLK. C ⟷ GRY. D ⟷ ORG. E ⟷ – F ⟷ GRY.		(terminal) (wire colour) A ⟷ BLK. B ⟷ BLK. C ⟷ GRY. D ⟷ ORG. E ⟷ GRY. F ⟷ –	
	<TOP VIEW>  			
(3) Wiring change of 4P terminal	 			
(4) Tape speed adj.	Perform the tape speed adj. referring sec. 6-11.			

(5) Alignment tape PB check	(i) Confirm that no-abnormality in playback picture of alignment tape. (ii) Touch the upper edge of upper drum softly, and check that the playback picture return normal in a short time (to check servo lock).

1-16. NOTES FOR MECHANICAL ALIGNMENT

(1) The descriptions of the main parts replacement (Section 3) and the mechanical adjustment (Sections 4 to 6) are of the procedures in the state that the cassette-up compartment is not attached to the machine. Consequently the machine's mechanism must be adjusted after the cassette-up compartment is removed. The compartment can be removed by loosening the four screws that are securing the compartment. Each of the four screws is held by a plate spring for preventing the screw from loss.



(2) It is instructed in the description of the mechanical adjustment, to use an alignment tape for the tracking adjustment. The tape must be the RR5-1S, PAL (SONY Part No. 8-960-015-61) or the RR5-1S, NTSC (SONY Part No. 8-960-015-01). The SYSTEM SELECT switch must be set to "PAL/SECAM" when the RR5-1S, PAL is played back. It must be set to "NTSC" for the RR5-1S, NTSC. The adjustment procedure stated is the case that the RR5-1S, PAL is used.

(3) TOTSU-type screws are used in the VP-2031. It is recommended to use the screwdriver only for this type screws for increasing work efficiency.

Screwdriver for 2.6mm, Screwdriver for 3mm } SONY Part No. 7-721-050-63
Screwdriver for 4mm SONY Part No. 7-721-050-64

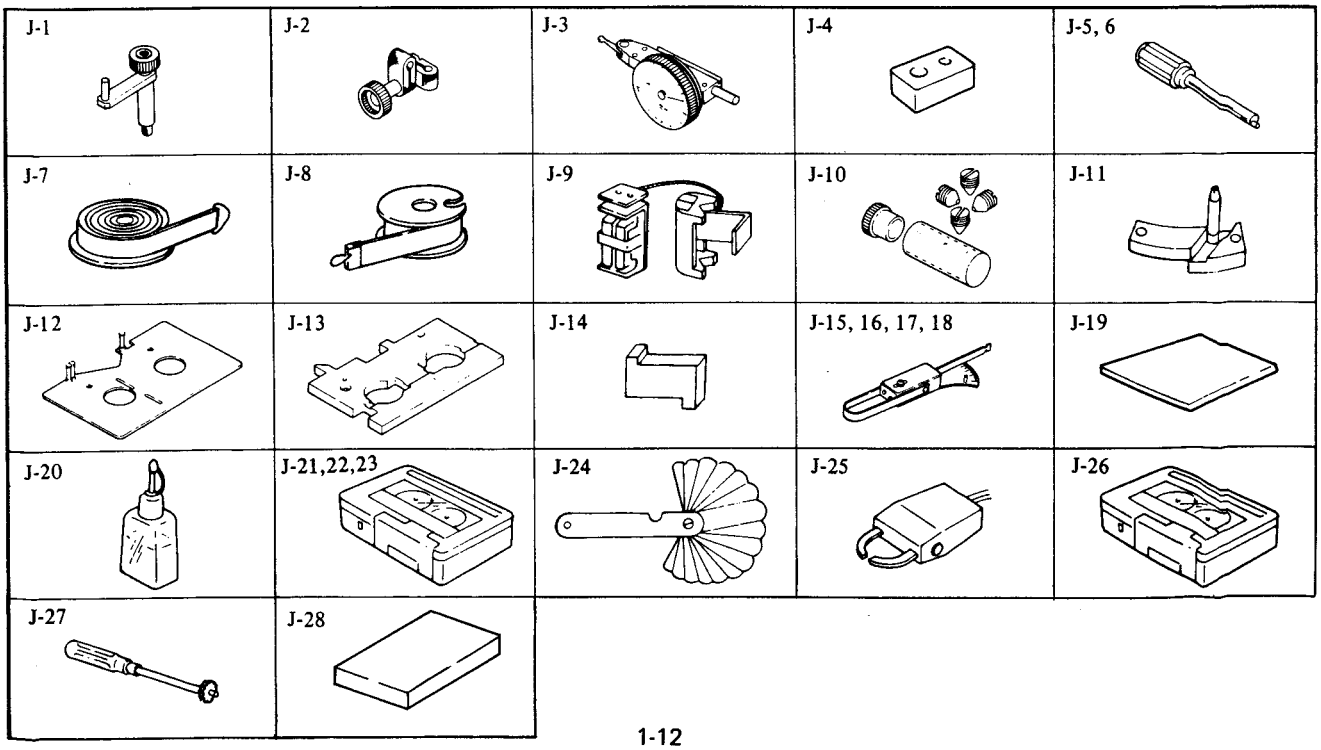
1-17. NOTES FOR ELECTRICAL ALIGNMENT

Electrical system alignment procedures are described on assumption that the mechanical system adjustments have been completed. If a suspicious point exists after the electrical system alignment, the mechanical system must be checked.

Electrical system alignment procedures are divided by systems such as power supply system, servo system, etc. The adjustment items are arranged following the adjustment sequence in each system and the adjustment must be performed one by one following the arrangement. If the adjustment order is inverted, a correct adjustment result cannot be obtained. The complete alignment of the electrical system can be accomplished only by the systematic adjustments.

1-18. JIGS REQUIRED FOR ALIGNMENT

Ref. No.	Part No.	Description	Purpose
J-1	J-600-182-0A	Drum Eccentricity Gauge (3)	Upper Drum Eccentricity Adj.
J-2	J-600-183-0A	Drum Eccentricity Gauge (2)	
J-3	J-600-184-0A	Drum Eccentricity Gauge (1)	
J-4	J-600-193-0A	Drum Eccentricity Gauge (4)	
J-5	3-702-390-01	Eccentric Screwdriver (4φ)	Position Adj.
J-6	3-702-391-01	Eccentric Screwdriver (5φ)	Audio/CTL Head Position Adj.
J-7	8-899-999-53 (3-702-215-01)	100mm dia Torque Measurement Tape	Measurement of Torque
J-8	8-899-999-51 (3-702-213-01)	38mm dia Torque Measurement Tape	FWD Back Tension Adj.
J-9	J-6001-085-A	Pinch lever Adjustment Jig	Pinch Lever Right Angle Adj.
J-10	J-600-229-0A	Dihedral Adjusting Screw	Video Head Dihedral Adj.
J-11	3-702-394-01	FWD Back Tension Measurement Jig	FWD Back Tension Adj.
J-12	3-702-216-01	Back Tension Adjustment Jig	Back Tension Adj.
J-13	3-702-398-01	Position Jig	Tape Guide Position & Reel Table Height Adj.
J-14	3-702-397-01	Reel Table Height Adj. Jig	Reel Table Height Adj.
J-15	7-732-050-20	Tension Scale (50g Full Scale)	Measurement of Back Tension & Torque
J-16	7-732-050-30	Tension Scale (100g Full Scale)	
J-17	7-732-050-40	Tension Scale (200g Full Scale)	
J-18	7-732-050-50	Tension Scale (500g Full Scale)	
J-19	2-034-697-00	Chamois	Cleaning
J-20	Y-2031-001-0	Cleaning Fluid	Cleaning
J-21	8-960-015-61	Alignment Tape RR5-1S PAL	For PAL System & SECAM System — Tracking, Audio, Video & Overall Alignment
J-22	8-960-014-87	Alignment Tape RR4-7S SECAM Colour-bar	For SECAM System
J-23	8-960-015-01	Alignment Tape RR5-1S, NTSC	For NTSC System
J-24	9-911-053-00	Thickness Gauge	For Clearance Check
J-25	Standard products	Head Demagnetizer HE-2 or HE-3	Degaussing of Heads
J-26	Standard products	Video Cassette Tape (KCA-60)	Overall Alignment
J-27	J-600-906-0A	Screwdriver with gear	Tension Arm Position Adj.
J-28	J-600-983-0A	Flatness Plate	CTL PB Head Position Adj.



SECTION 2
PERIODIC CHECK AND MAINTENANCE

It is recommended to follow the subsequent Periodic Check and Maintenance in order to obtain the maximum performance and full functions of the machine and to obtain longer tape life.

2-1. CHECK PROCEDURE AFTER COMPLETION OF MACHINE REPAIR WORK

Perform the following maintenance after the repair without regarding the operating hours of the machine.

(1) Cleaning of Video Heads.

- Press chamois (Jig Ref. No. J-19) moistened with the cleaning fluid (Jig Ref. No. J-20) and turn the upper drum slowly with the hand, cleaning the heads. (Never turn the motor by the electric power for the cleaning.)
- Never move the chamois in the vertical direction of the head tip in the cleaning. It tends to damage the head tips.

(2) Cleaning the tape running system.

- Wipe the tape bearing surface (of the tape guide, upper/lower drum, stationary heads, capstan shaft, pinch roller, etc) with a piece of chamois saturated with the cleaning fluid.

(3) Cleaning of drive system.

- Wipe the drive system (such as belt, idler, and reel table surface) with a piece of chamois saturated with the cleaning fluid.

(4) Measurement of the Overall Take-up Torque.

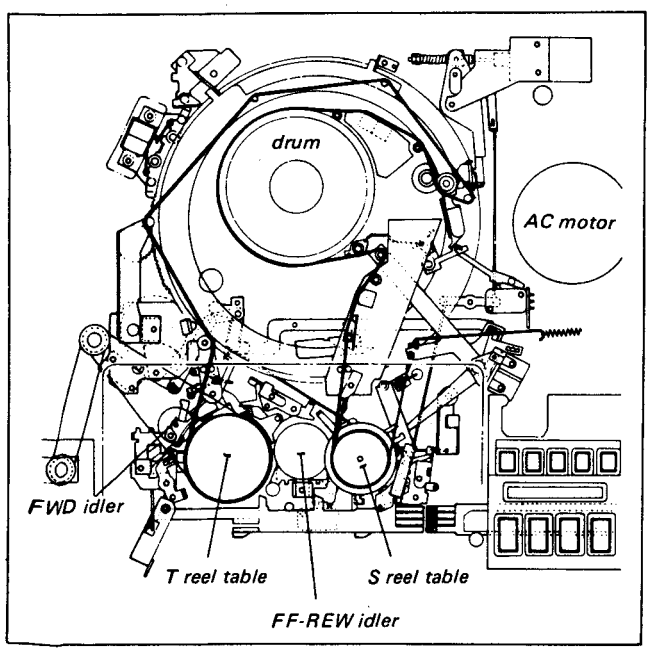
2-2. PERIODIC CHECK AND MAINTENANCE

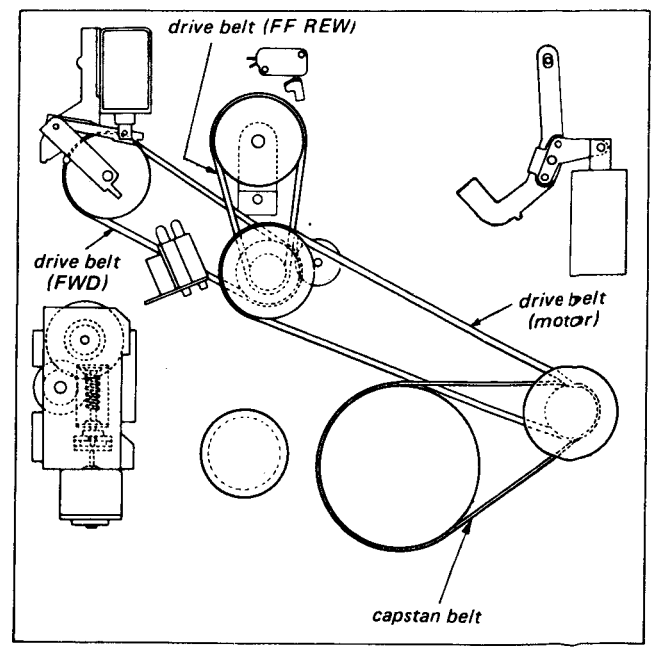
It is recommended to the following check and maintenance regarding of the operating hours.

○: Cleaning ◎: Lubrication ★: replacement ◇: check

	ITEM \ OPERATING HOURS (H)	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	REMARKS
Tape Path system	Tape path cleaning	○	○	○	○	○	○	○	○	○	○	Perform whenever repair work is attempted.
	Audio/CTL head cleaning and degaussing											
	Video heads cleaning, degaussing and replace	○	★	○	★	○	★	○	★	○	★	Life of video heads are effected extensively by operating ambinet condition.
Bearing system	Lubrication to eccentric pulley of drive belt	—	◎	—	◎	—	◎	—	◎	—	◎	• Remove the pulley or reel table. • Apply a drop of SONY oil after cleaning of the shaft.
	Lubrication to shaft of take-up reel table and reel table replacement	—	◎	—	◎	—	★	—	◎	—	◎	
	Lubrication to shaft of supply reel table and reel table replacement	—	◎	—	◎	—	◎	—	★	—	◎	
	Lubrication to capstan holder bearing	—	◎	—	◎	—	◎	—	◎	—	◎	• Apply a drop of SONY oil to capstan holder.
Drive/torque system	Pinch roller cleaning and replace	○	○	○	○	○	★	○	○	○	○	• Clean the idler with a piece of cloth saturated with the cleaning fluid.
	FWD idler cleaning and replace	—	○	—	○	—	○	—	★	—	○	
	FF-REW idler cleaning and replace											
	Capstan belt cleaning and replace	—	○	—	★	—	○	—	★	—	○	• Clean the belt with a piece of cloth saturated with the cleaning fluid. • Perform whenever repair work made other than left column. • Replace according to operating hours as shown in left column, or after every 2 years.
	Drive belt (MOTOR) cleaning and replace	—	○	—	○	—	★	—	○	—	○	
	Drive belt (FF-REW) cleaning and replace											
	Drive belt (FWD) cleaning and replace											
	Solenoid iron core cleaning	—	—	—	○	—	—	—	○	—	—	• Clean the solenoid iron core and inside the coil with dry cloth.

	ITEM \ OPERATING HOURS (H)	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	REMARKS
Function check	Excessive noise sound	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	• Adjust or replace parts causing noise.
	Measurement of overall take-up torque	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	• Measure according to sec. 5-6 Spec. less than 50g (x 5cm)
	Measurement of REW torque	—	—	—	◇	—	—	—	◇	—	—	• Measure according to sec. 5-7 Spec. 240 ~ 350g (x 5cm)
	Measurement of FWD back tension	—	—	—	◇	—	—	—	◇	—	—	• Measure according to sec. 5-4 Spec. 85 ~ 90g (with jig tape)
	Measurement of REW back tension	—	—	—	◇	—	—	—	◇	—	—	• Measure according to sec. 5-3 Spec. 50 ~ 70g (with jig tape)
	Measurement of threading back tension	—	◇	—	◇	—	◇	—	◇	—	◇	• Measure according to sec. 5-1 Spec. 15 ~ 25g (x 5cm)
	Measurement of supply side main brake torque	—	◇	—	◇	—	◇	—	◇	—	◇	• Measure according to sec. 4-4-2 Spec. 100 ~ 130g (x 5cm)
	Measurement of take-up side main brake torque	—	◇	—	◇	—	◇	—	◇	—	◇	• Measure according to sec. 4-4-3 Spec. 100 ~ 130g (x 5cm)
	Playing back functional check	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	





2-3. OTHERS

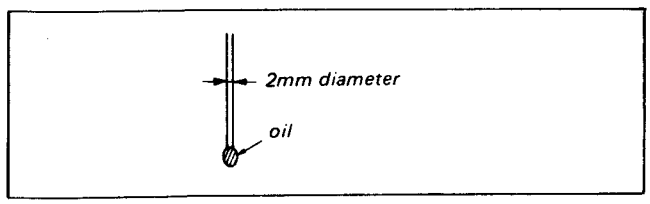
(1) SONY oil

- Be sure to use the SONY oil as the lubrication oil. (If oil other than the SONY oil is used, various troubles due to a different viscosity tends to be caused.)

  SONY oil : Part No. 7-661-018-01
  (Mitsubishi diamond oil #440)

- Use the SONY oil in which dust or other foreign material have not mixed for lubricating the bearing. (If foreign material is in the oil, wear or burning of the bearing tends to be caused.)

- A drop of the lubrication oil in the following description is equal to an oil drop on a pick with 2 mm diameter as shown in the figure.



(2) Regarding overhaul of equipment

When overhaul of an equipment is attempted, replace parts referring list. For the parts not listed in upper list, such as motors and heads, refer the following items.

Audio/CTL Head	;	approx. 3000 hours
Threading dc motor	;	depending on threading times (approx. 3000 hours)
AC motor	;	approx. 4000 hours

SECTION 3
REPLACEMENT OF MAJOR PARTS

3-1. REPLACEMENT OF UPPER DRUM ASS'Y (including eccentricity adj.)

- The Video Heads cannot be replaced as a single head component. Replace the Upper Drum Ass'y as a whole when any one of these heads is required to be replaced.
- Never touch the hex. nut in the center of the Head Drum Assembly.

1. Unsolder the four leads of the Video Head from the VH board and remove the Upper Drum Ass'y from the Head Drum Assembly.
2. Clean the flange and bottom surfaces of the replacement Upper Drum Assembly with chamois moistened with methanole or other cleaning fluid.
3. Place the Upper Drum Assembly so that the white lead head is close to the small drill mark (near the VH board) on the flange surface. Position the Upper Drum Ass'y over the mounting holes. Thread the two screws snugly but do not tighten.

   (If the white lead is not brough to the small drill mark hole, the polarity of the head is reversed in the playback and the playback picture cannot be obtained.)
4. Assemble the drum eccentricity adj. jigs (1), (2), (3) and (4) (Jig Ref, Nos. J-1, -2, -3, -4) as shown in Fig. 3-1. Mount the assembled jigs on the slant base so that the tip probe positions at the point about 5mm apart from the top edge of the upper drum.
5. Turn the upper drum slowly clockwise (↻) (the same direction with its rotation) and confirm that the pointer deflection of the gauge is within 8μ during one complete turn of the upper drum. If the specification is satisfied, processed with Step 7 and the followings. If it is not, perform Step 6.
6. Tap the inside of the upper drum with a nylon hammer or a screwdriver handle and like so that the gauge deflection remains within 8μ.
7. After the adjustment, tighten the two screws that are securing the upper drum, alternately and gradually (Tightening torque; more than 10kg.cm)
8. After the screws are tightened, check again that the eccentricity of the upper drum is within 8μ meters.
9. Solder the leads from the video heads to the VH board.
10. Insert, thread and run the cleaning cassette type KCS-1C in normal FWD mode for 10 to 20 seconds (in first use). (Purpose is to smooth out the surface of the video heads.)

    Note: When a cleaning cassette is used repeatedly, it requires slightly longer FWD time. However, 4 or 5 times of use is the maximum life of a cleaning cassette.

    Abrasive power of the KCS-1C is approx. 1 micron per every ten seconds.
11. When this replacement is attempted, perform checks for the various values given in the following sections.

6-10-2.	Video head dihedral adj.
6-8-1.	Tape path adj.
6-5.	F-Forward and Rew modes tape run adj.
6-6.	Forward mode tape run adj.
6-8-2.	Audio head height adj.
6-8-3.	Audio head phase adj.
6-8-4.	Audio/CTL head position adj.
	Switching position adj.
	PB RF system alignment (1)
	Colour Killer adj.

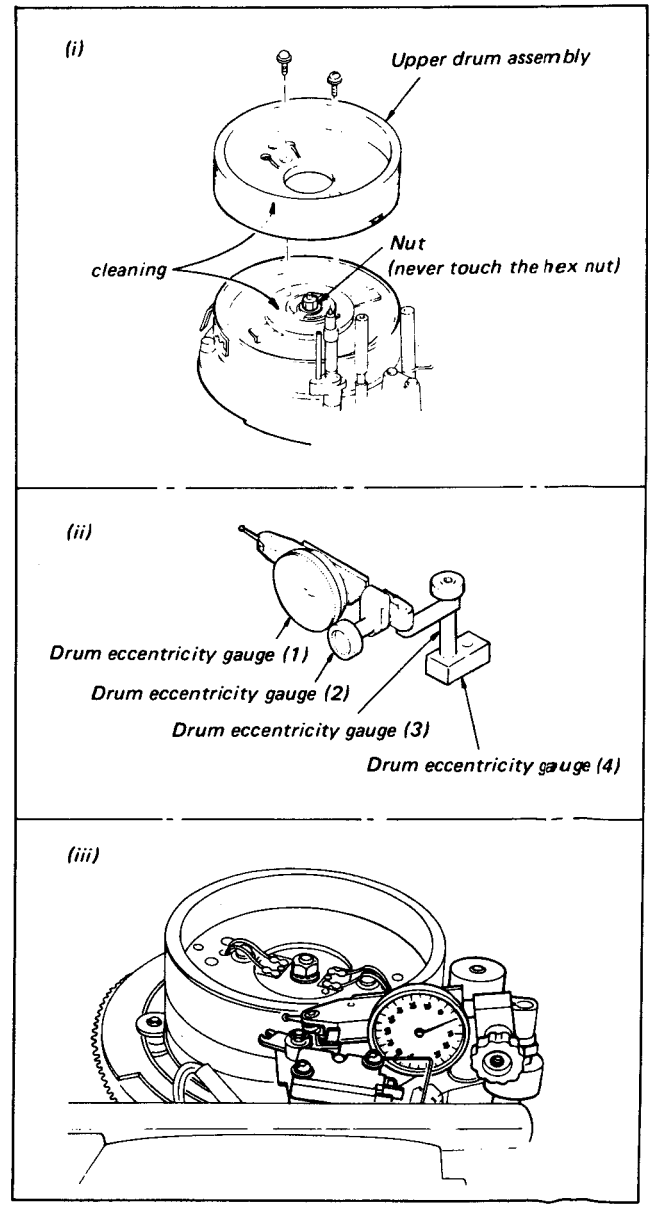


Fig. 3-1. Replacement of upper drum

3-2. REPLACEMENT OF DRUM UNIT

- When replacing the Drum unit, do not remove the slant base, but leave the slant base on the main chassis. Remove the defective drum unit from the slant base.
  Therefore height of the tape guides and stationary heads remain unchanged even after the drum unit replacement so that the adjustment after drum replacement, becomes easy.

1. Disconnect the connector. Remove the three screws shown in Fig. 3-2, and remove the defective drum.
2. Place the replacement drum unit on the slant base. Install the drum into the slant base while turn the drum unit in clockwise direction. (Turning the drum clockwise increases the head-to-tape contact at the drum's input and also overlap amount.)
3. Re-connect the connectors.

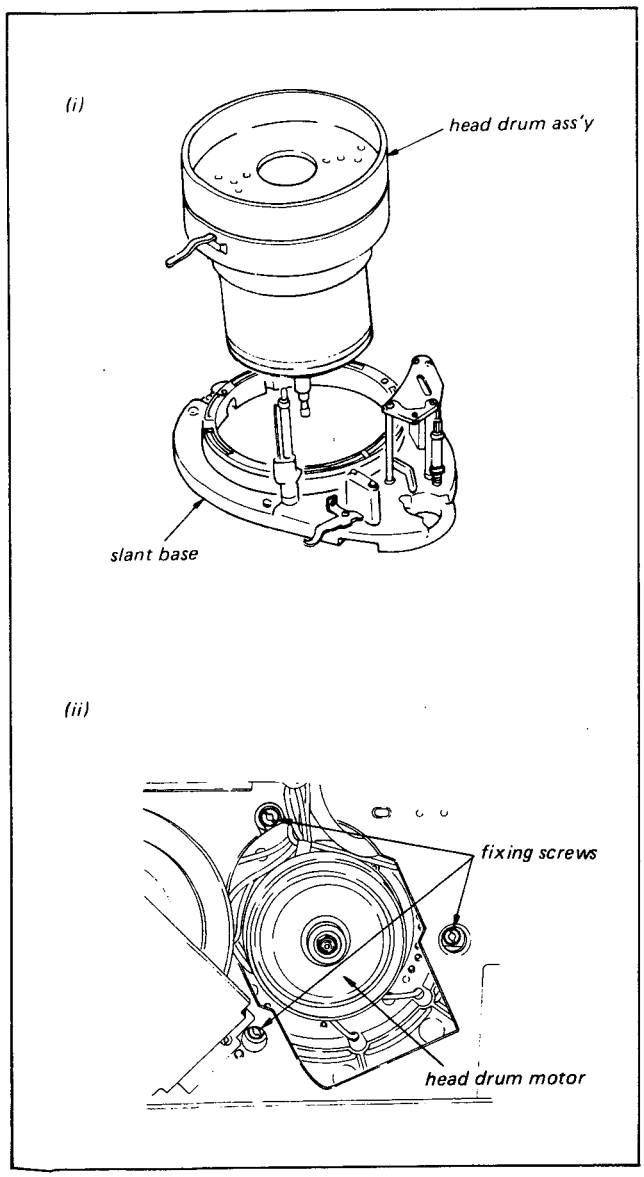


Fig. 3-2. Replacement of head drum ass'y

4. When this replacement is attempted, perform checks for the various values given in the following sections.

6-8-1. Tape path adj.
6-5. F-Forward and Rew mode tape run adj.
6-6. Forward mode tape run adj.
6-8-2. Audio head height adj.
6-8-3. Audio head phase adj.
6-8-4. Audio/CTL head position adj.
Switching position adj.
PB RF system alignment
Colour Killer adj.

3-3. REPLACEMENT OF AC MOTOR

- This motor contains a thermal fuse which cuts the internal circuit of the motor when the temperature rises abnormally. It restores the circuit when the temperature decreases to normal.

1. Remove the motor pulley on the rear of the machine. (Hold the motor fan and then unthread the pulley in counter-clockwise direction.)
2. Disconnect the connector of the AC motor. Loosen the screw holding the hum proof belt. Remove the four fixing screws and remove the motor.
3. Remove the motor pulley stopper from the defective motor and install it to the new motor as shown in Fig. 3-3.
4. Install the washer for ground between the AC motor and the bracket. Tighten the four fixing screws and the hum proof belt onto the machine.

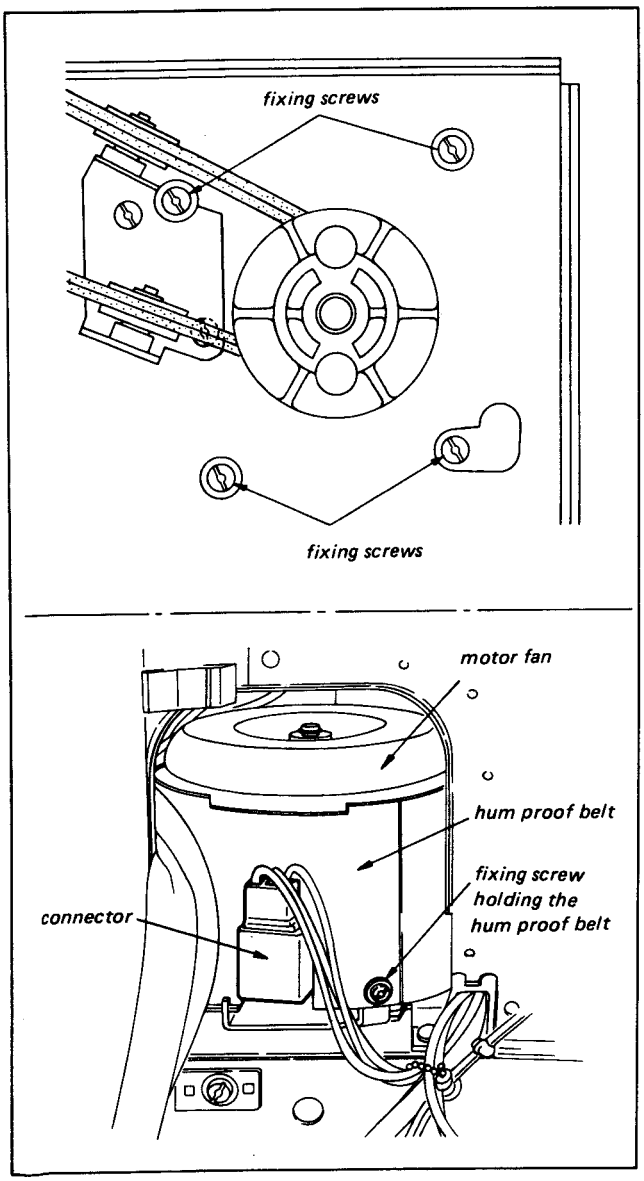


Fig. 3-3. Replacement of AC motor

3-4. REPLACEMENT OF THREADING DC MOTOR

1. Remove the Threading Motor Ass'y from the Gear Box Ass'y as shown in Fig. 3-4.
2. Unsolder the leads of the Threading Motor from the printed circuit board and remove the printed circuit board. Replace the Threading Motor. Install the printed circuit board to the threading motor bracket by tightening screws.
   Solder the leads of the DC motor to the printed circuit board. (If soldering is performed first and tightening is then attempted, sometimes DC motor cannot be mounted to the bracket.)
3. Install the DC motor assembly temporarily to the gear box ass'y.
4. Adjust position of the threading motor assembly so that the motor coupling shown in Fig. 3-4 can go smoothly into the gear box rotating spindle. Tighten then screws.
5. Insert the gear box coupling into the gear box assembly rotating spindle in the direction as shown in Fig. 3-4. Push then the motor coupling towards the gear box coupling. Adjust then the clearance between both couplings as shown in Fig. 3-4, and tighten finally the set-screw.

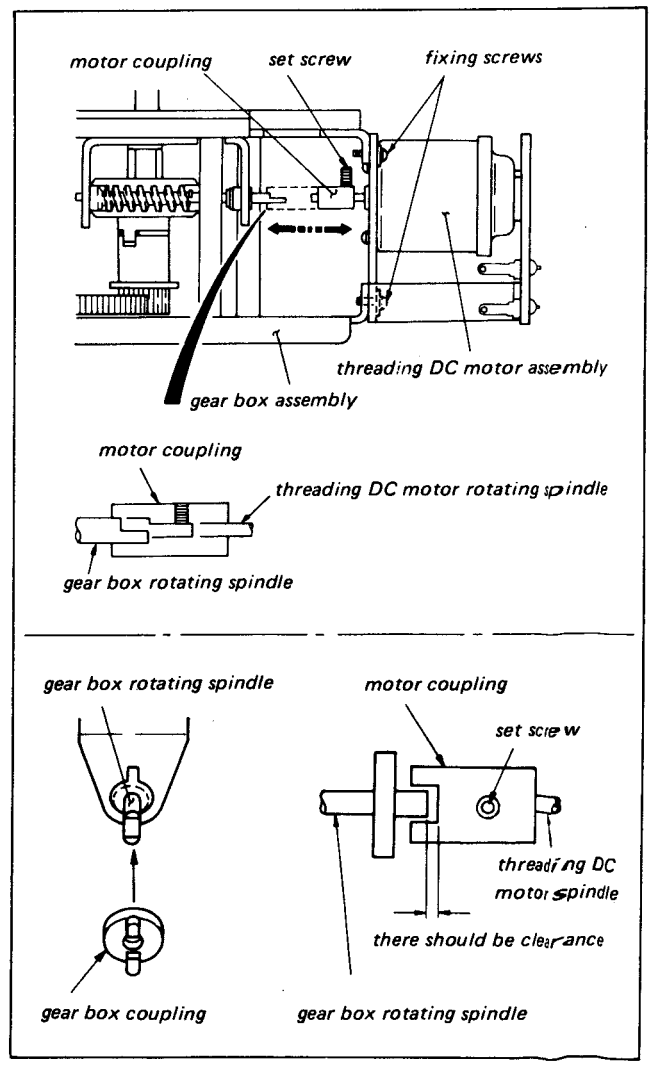


Fig. 3-4. Replacement of threading DC motor

3-5. REPLACEMENT OF AUDIO/CTL HEAD

1. Remove the three screws from the studs, and remove the Audio/CTL Head Ass'y as shown in Fig. 3-5.

   Note: DO NOT TOUCH ANY SCREW OTHER THAN THESE THREE SCREWS. If any screw other than these three screws is manipulated, head's slantness azimuth, etc will become mis-aligned that makes subsequent adjustment difficult.

2. Loosen the screws on the head assembly as shown in Fig. 3-5 and remove the Audio/CTL Head from the head assembly.

3. Take notes of the colors of lead wires, and write them down on the paper before unsoldering/removing the lead wires. Remove then lead wires.

4. After head replacement in completed, perform the following checks for the correct values given in the following sections.

   sec. 6-8-2. Audio Head Height Adj.
   sec. 6-8-3. Audio Head Phase Adj.
   sec. 6-8-4. Audio/CTL Head Position Adj.
   sec. 6-6. FWD Mode Tape Run Adj.
   Audio Alignment

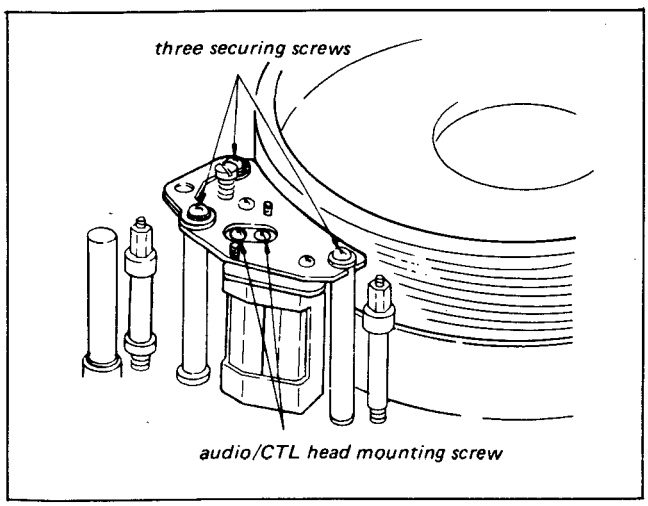


Fig. 3-5. Replacement of Audio/CTL head

3-6. REPLACEMENT OF ERASE HEAD BASE ASS'Y

• It is rare case to replace the erase head base ass'y. But when replacing the erase head base ass'y, replace the standardized replacement erase head base ass'y for service work only.

• Tape guide of the erase head ass'y that are actually used in equipment is the rotating tape guide while other side is the fixed tape guide.

• But two tape guides of the standardized replacement erase head base ass'y are rotating tape guides.

• Install the standardized replacement erase head base ass'y Install the tape slack sensor arm ass'y that are actually used in equipment.

• And when replacing the tape guide, please order the parts individually shown in the Exploded Views.

• After erase head base ass'y replacement is completed, perform the following checks and adjustments.

4-5-1. Supply Tension Regulator Position Adj. (FWD mode)
4-5-4. Supply Tension Regulator Stopper Position Adj.
6-8-1. Tape Path Adj.
5-2. Forward Mode, Tape Hold-Back Tension Adj.
5-4. Fast-Forward Mode, Tape Hold-Back Tension Adj.
6-5. Fast-Forward Mode and Rewind Modes Tape Run Adj.

3-7. REPLACEMENT OF CTL PB HEAD

1. Remove the securing screw (L) from the erase head base and remove the head ass'y as shown in Fig. 4-6.

   Note: Do not touch any screw other than the securing screw (L). The three screws especially, set-screws (A), (B), (C) (height, slant, azimuth adj.) should not manupulated.

2. Take notes of the colours of lead wires, and write them down on the paper before unsoldering/removing the lead wires. Remove then lead wires.

3. Replace the CTL PB head and press the head in the direction shown by the arrow in Fig. 4-6. And tighten the two fixing screws.

4. Install the head ass'y to the erase head base and solder the leads.

5. CTL PB Head Height Adj.

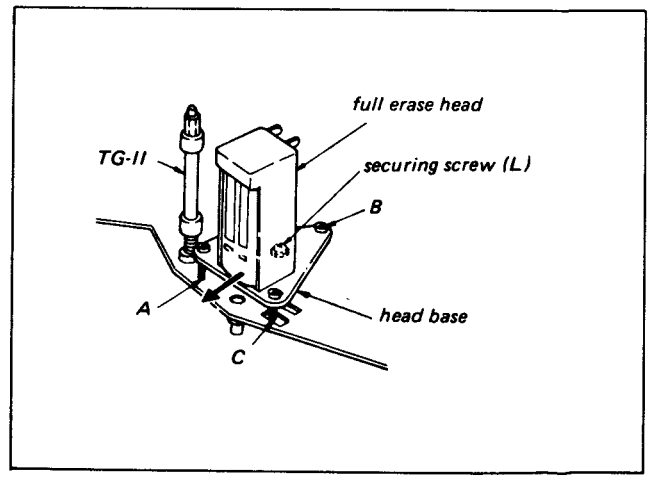


Fig. 3-6. Replacement of CTL PB head

SECTION 4
LINK AND DRIVE SYSTEM ALIGNMENT

4-1. REEL TABLE ADJUSTMENT

Since the reel table height from the chassis functions as the reference height in the entire tape thread and run system, it is requested that the reel table height adjustment should be attempted carefully, and deliberately.

4-1-1. Take-up Reel Table, Height Adj.

1. Put the machine into the EJECT mode.
2. Install the Position Jig (Jig Ref. No. J-13) on the machine where a cassette is installed.
3. Install the Reel-Table Height Adjustment Jig (Jig Ref. No. J-14) as shown in Fig. 4-1, in the shaded portion of the Position Jig.

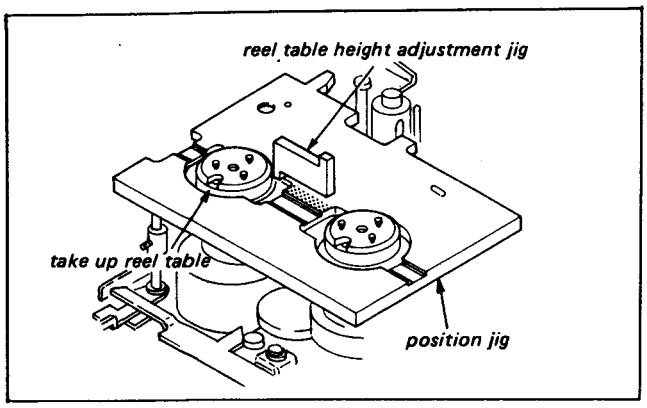


Fig. 4-1. Take-up reel-table height adjustment (EJECT mode)

4. Inspect the Reel Table Height Adj. Jig so that it has two probes as shown in Fig. 4-2 (iii). One probe is longer while the other probe is shorter.

   If the reel table has correct height, the shorter probe of the jig can slide over reel table, leaving a space between jig and reel table as shown in Fig. 4-2 (i), while the longer probe of the jig is blocked, and cannot slide over reel table as shown in Fig. 4-2 (ii).

If the reel table height is incorrect, adjust the height, by adding or removing washer under the reel table.

- Selective washer identification for adj.

Washer 6 mm diameter, 0.5 mm thick	3-701-444-21
Washer 6 mm diameter, 0.25 mm thick	3-701-444-11
Washer 6 mm diameter, 0.13 mm thick	3-701-444-01

- Apply a drop of SONY oil on the reel spindle as shown in Fig. 4-3, whenever the reel table is removed and is adjusted its height with washer. Amount of oil should be one drop that is scooped by tip of 2 mm diameter twig such as pencil lead.

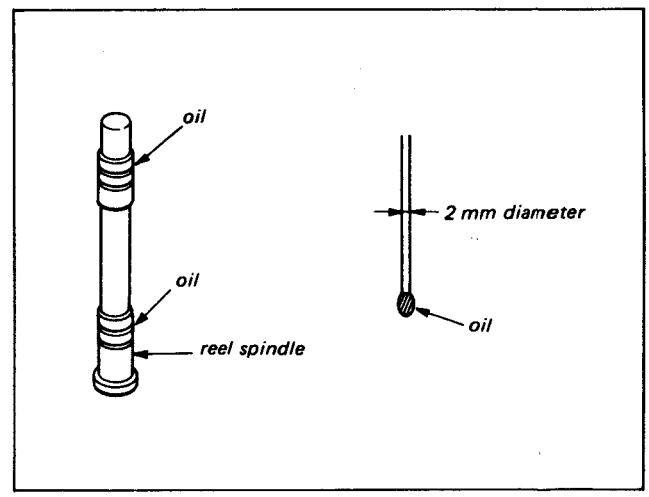


Fig. 4-3. Lubrication of reel spindle

5. Tighten a screw on top of the reel table (reel table securing screw).
6. As Fig. 4-4 (i), inspect the vertical play of the Take-up Reel Table with use of a slide vernier calliper. Push up and down the reel table for inspection that the play should be 0.15 mm ~ 0.25 mm. If not, remove or add a selective washer, on top of the reel table as shown in Fig. 4-4 (ii). Use same washers shown in step 4.

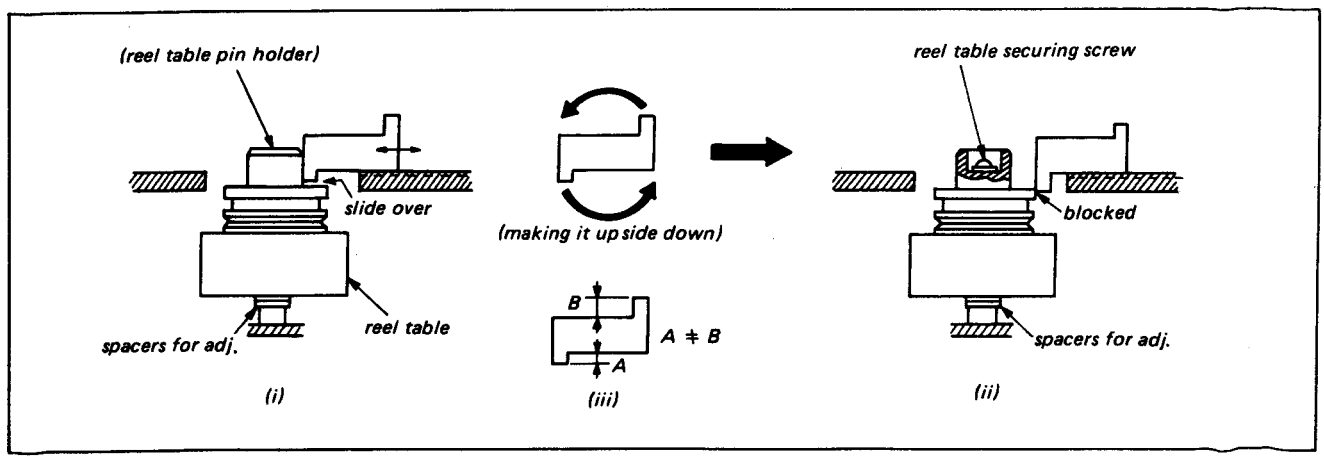


Fig. 4-2. Reel table height adjustment (EJECT mode)

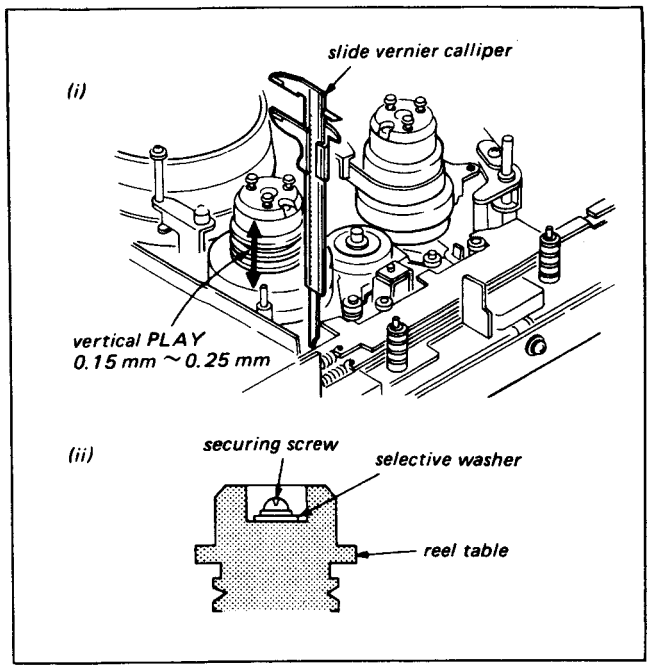


Fig. 4-4. Reel table vertical play adjustment (EJECT mode)

4-1-2. Supply Reel Table, Height Adj.

1. Put the machine into the EJECT mode.
2. Install the Position Jig (Jig Ref. No. J-13) on the machine where a cassette is installed.
3. Install the Reel-Table Height Adj. Jig (Jig Ref. No. J-14), as shown in Fig. 4-5, in the shaded portion of the Position Jig.
4. Proceed to the Supply Reel-Table Height inspection and adjustment, following the sec. 4-1-1 step 4.
   - After adjustment, perform the Supply Tension Regulator Position Adj. (FWD mode) Sec. 4-5-1 since the supply reel table brake band is once removed in the course of the Supply Reel Table Height Adj.
5. Proceed to the Supply Reel-Table vertical play inspection following the sec. 4-1-1 step 6.

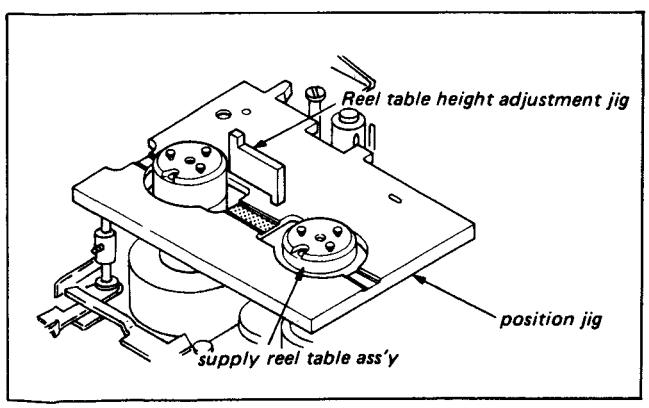


Fig. 4-5. Supply reel table height adj. (EJECT mode)

4-2. SOLENOID SYSTEM ADJUSTMENT

4-2-1. Main Solenoid Adj.

- If the Main Solenoid position happens to be incorrect in such a condition that the solenoid's iron core travelling stroke is short (i.e. the clearance between the white plastic piece and the square opening of the Function Block, as shown in Fig. 4-6.), possible trouble is that the machine's mechanism links are not moved to the required position in respective modes of FWD, FF, REW and EJECT, and that the normal tape run cannot be expected.
- If, in opposite, the solenoid's iron core travelling stroke is too long, solenoid's pulling power becomes weak so that the possible trouble is that the mechanism link is unlocked (released).

1. Without threading cassette, put the machine into the FF mode.
2. While the machine is put into the FF mode, locate the main solenoid, observe the clearance between the square opening of the function block and the plastic white block, as shown in Fig. 4-6.

   The clearance should be 0.1 mm ~ 0.5 mm. If not, adjust the position of the main solenoid with a 4 mm diameter eccentric screwdriver (Jig Ref. No. J-5).

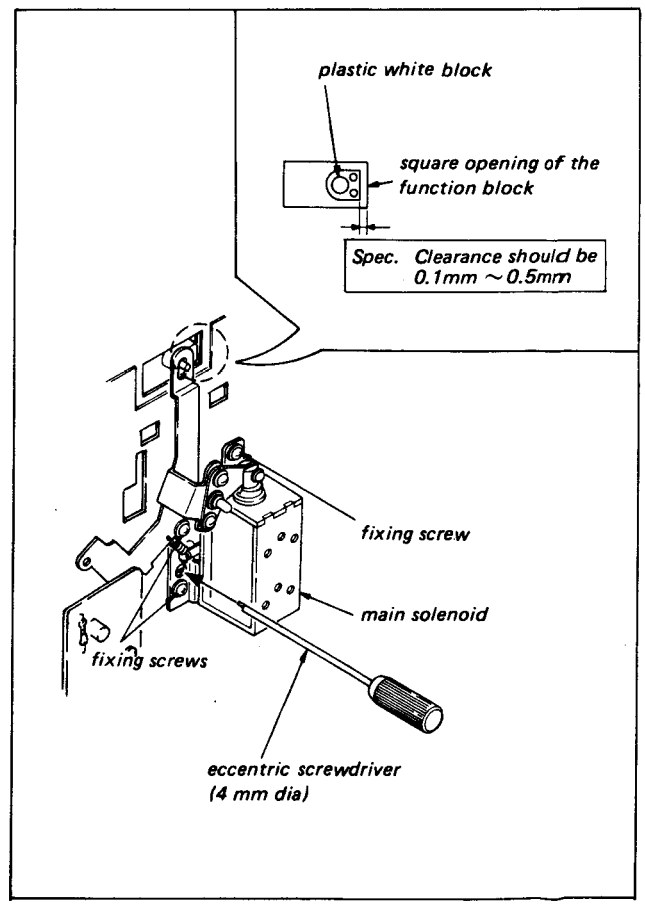


Fig. 4-6. Main solenoid adjustment (FF mode without tape)

4-2-2. Idler Solenoid Adj.

- If the Idler Solenoid happens to be incorrect as shown in Fig. 4-7 that the clearance is insufficient, the possible trouble is that the take-up reel-table rotation becomes unstable, because the torque, which is generated by motor and is transmitted by a rubber belt, cannot be duely transmitted to the Take-up Reel Table.
- If, in opposite, the clearance A is too much, the Idler Solenoid pulling power becomes weak in the modes of the FWD, Unthreading and EJECT. If the machine is used for long hours continuously, the Idler Solenoid temperature increases to weaken the solenoid pulling power.

1. Turn the POWER ON. Without threading cassette, set the machine into the FWD mode.
2. While the machine is in FWD mode, check to see that the clearance A shown in Fig. 4-7 is 0.3 mm ~ 0.7 mm. If not, adjust the solenoid arm position with 4 mm diameter eccentric screwdriver (Jig Ref. No. J-5).

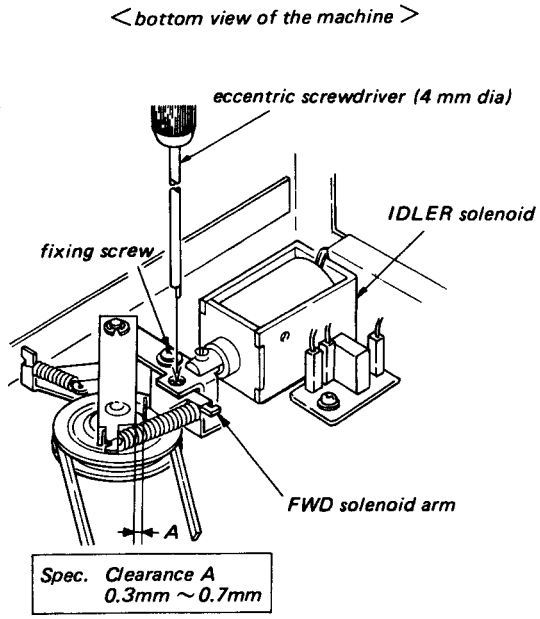


Fig. 4-7. Idler solenoid adjustment (FWD mode without cassette)

4-2-3. Function Solenoid Position Adj.

If the Function Solenoid position becomes incorrect, the trouble is that the machine cannot be put into the desired mode even though the Function button is pressed, and that the machine remains in the FR STOP mode.

1. Press the function button of the replaced Function Solenoid to energize the Function Solenoid.
2. Check to see that the clearance between the chassis and the selector is 1.6 mm ~ 2.4 mm. If not adjust the position of the Function Solenoid as shown in Fig. 4-8.

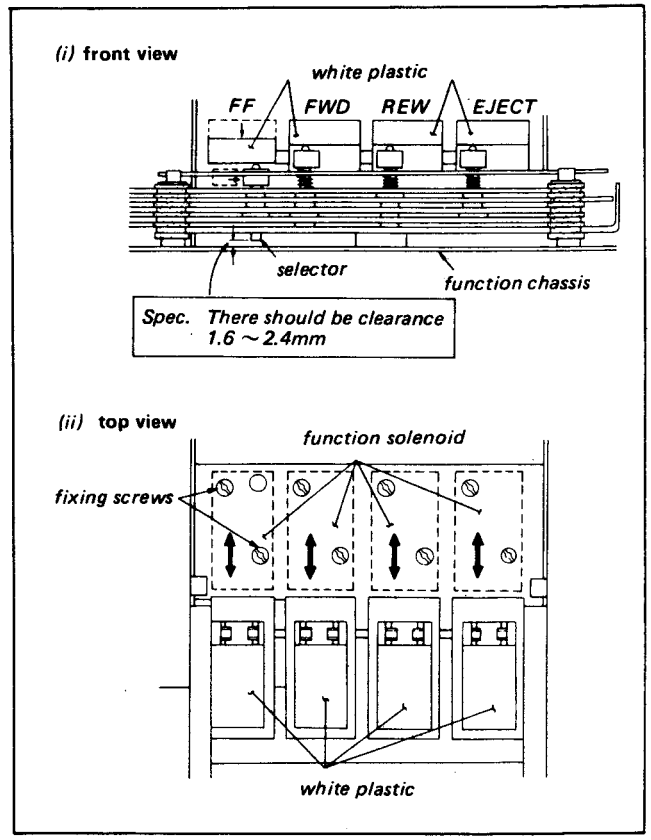


Fig. 4-8. Function solenoid position adj. (power : ON mode)

4-3. THREADING ARM ADJUSTMENT

There are three adjustments to be performed in the section 4-3 Threading Arm Adjustment, i.e. 4-3-1 Margin Gear position adj. 4-3-2 Threading Arm Stopper position adj. and 4-3-3 FR Unthread End switch position adj. These three adjustments are closely related. If any one of these three adjustments is attempted, perform the rest of two adjustments at the same time.

4-3-1. Margin Gear Position Adj.

If a machine is left with this adjustment unfinished, the possible trouble is that the Threading Arm will not come out because the Threading Arm is obstructed by the Pinch Roller.

1. Put the machine into the EJECT mode.
2. Check to see that the Main Ring moves by 0.1 mm ~ 3 mm when the Main Ring is pushed with finger in the direction shown by the arrow in Fig. 4-9.

   If not, loosen the two screws with allen wrench shown in Fig. 4-9 and rotate the Margin Gear for the correct margin of 0.1 mm ~ 3 mm.

Approx. estimate of 3 mm margin ; If the Threading Roller is moved until it reaches the Threading Arm, as it is pushed by finger, its travelling distance is approx. correct 3 mm margin.

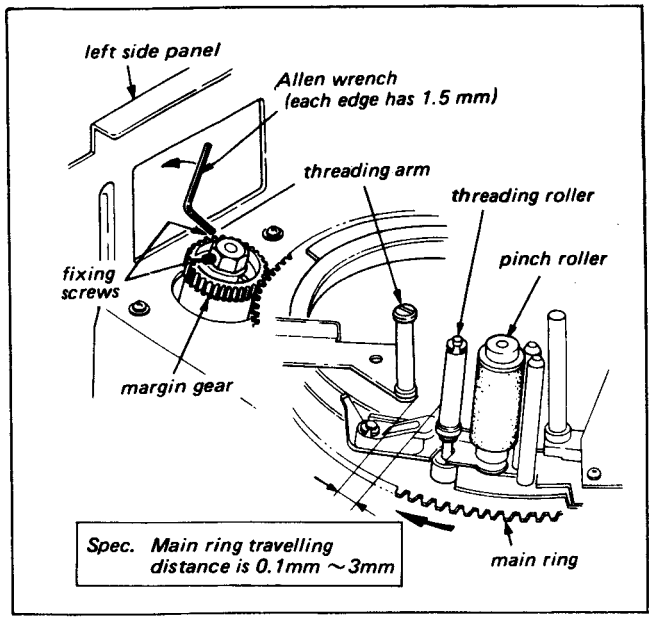


Fig. 4-9. Margin gear position adj. (EJECT mode)

- Method to adjust and fix the hex nut on top of the Margin Gear.

  (i) Turn the Allen wrench of 1.5 mm edge length ↶ 30 degrees as shown in Fig. 4-10 (i).

  (ii) While the Allen wrench is left inserted in the hex nut, rotate the hex nut together with the Allen wrench approx. 80 degrees as shown in Fig. 4-10 (ii).

  (iii) Tighten the Allen wrench screws.

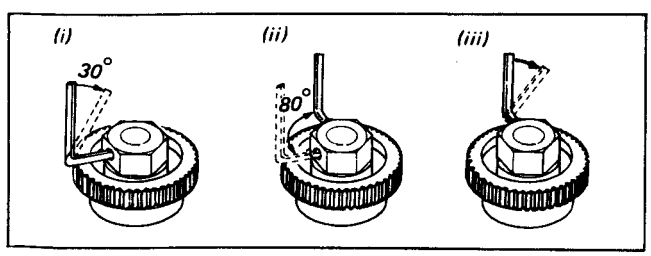


Fig. 4-10. Margin gear installation (EJECT mode)

When this adjustment is attempted, perform the checks of the various values given in the following section.

4-3-2. Threading arm stopper position adj.
4-3-3. FR unthread-end switch position adj.

4-3-2. Threading Arm Stopper Position Adj.

If a machine is left with this adjustment unfinished, the possible trouble is that the machine starts threading without tape in the cassette-in moment.

1. Without threading tape, put the machine into the FR-STOP mode.
2. Install the Position Jig (Jig Ref. No. J-13) on the machine as shown in Fig. 4-11.

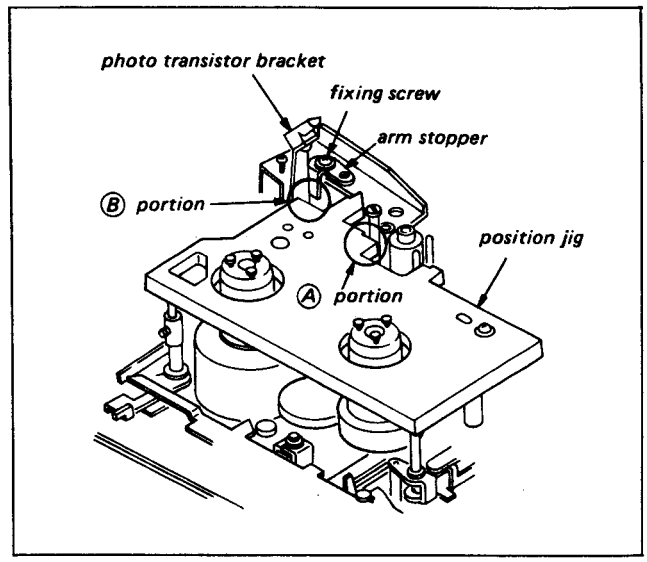


Fig. 4-11. Threading arm stopper adjustment (EJECT mode)

3. Put the machine into the EJECT mode.
4. Check to see that two requirements are simultaneously met at Ⓐ and Ⓑ portions in Fig. 4-11.

   Requirement-1 ; When Ⓐ is in contact, Fig. 4-12, Ⓑ should be in contact or the clearance should be less than 0.1 mm.

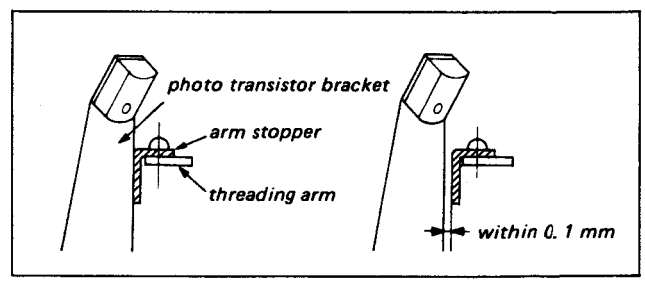


Fig. 4-12. When Ⓐ portion is in contact

Requirement-2 ; When Ⓑ is in contact, Fig. 4-13, Ⓐ should be in contact, or the clearance should be less than 0.4 mm.

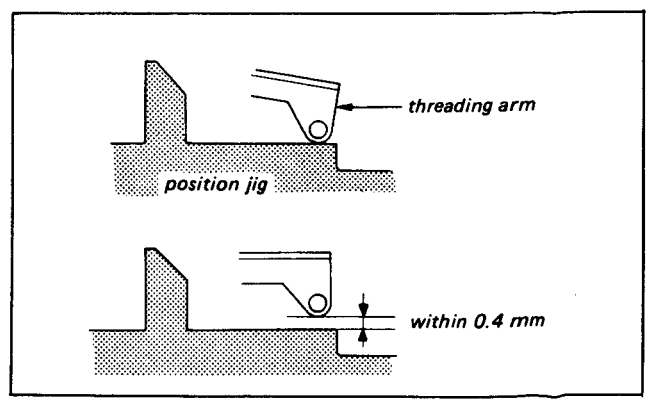


Fig. 4-13. When Ⓑ portion is in contact

If the above two requirements cannot be met, proceed to the step 5.

5. Loosen the fixing screw of the Arm Stopper referring Fig. 4-11. Adjust the Threading Arm Stopper to meet the two requirements in step 4.
   - ↻ Clockwise rotation of the Arm Stopper makes the Ⓐ in contact.
   - ↺ Counter-clockwise rotation of the Arm Stopper makes the Ⓑ in contact.

When this adjustment is attempted, perform the checks of the various values given in the following section.

4-3-1. Margin gear position adj.
4-3-3. FR unthread-end switch position adj.

4-3-3. FR Unthread-End Switch Position Adj.

- If this adjustment is improper such that the FR Unthread-End switch turns on earlier than expected in the Ejecting from the FR-STOP mode, (i.e. the switch turns on in a larger than 2.7 mm, for example 3 mm in Fig. 4-14), the possible trouble is that the Threading Arm will not return to its home position when the Eject is completed.
- If the FR Unthread-End switch will not turn on easily, the mechanism cannot go to the next operation even though the Arm returns because the Arm return is not detected electrically.

1. Without threading tape, put the machine into the FR-STOP mode.
2. Install the Position Jig (Jig Ref. No. J-13) as shown in Fig. 4-14.
3. Put the machine into the Eject mode.
4. Grasp the hex nut on top of the Margin Gear with a pliers as shown in Fig. 4-14 and turn the hex nut (↺) counter-clockwise until the FR Unthread-End switch is turned OFF to make a click sound.
5. While grasping the hex nut with a pliers, turn the hex nut slowly (↻) clockwise this time until the FR Unthread-End switch is turned ON to make a click sound.
6. Check to see that the clearance between the Position Jig and the Threading Arm is 0.7 mm ~ 2.7 mm when the click sound is made in step 5. If clearance is out of spec., proceed to step 7.
7. Loosen the two fixing screws securing the FR Unthread-End switch, shown in Fig. 4-14. Adjust the switch position.
   - Pressing the switch in the arrow direction in Fig. 4-14 makes the clearance wider.
   - Bringing the switch in the direction opposite to the arrow in Fig. 4-14 makes the clearance narrower.
   - Adjusting procedure; Bring the Threading Arm to the Position Jig with 1.5 mm clearance, and adjust the switch position so that it is just turn ON at this instance. Tighten the two fixing screws.

When this adjustment is attempted, perform the checks of the various values given in the following section.

4-3-1. Margin gear position adj.
4-3-2. FR unthread end switch position adj.

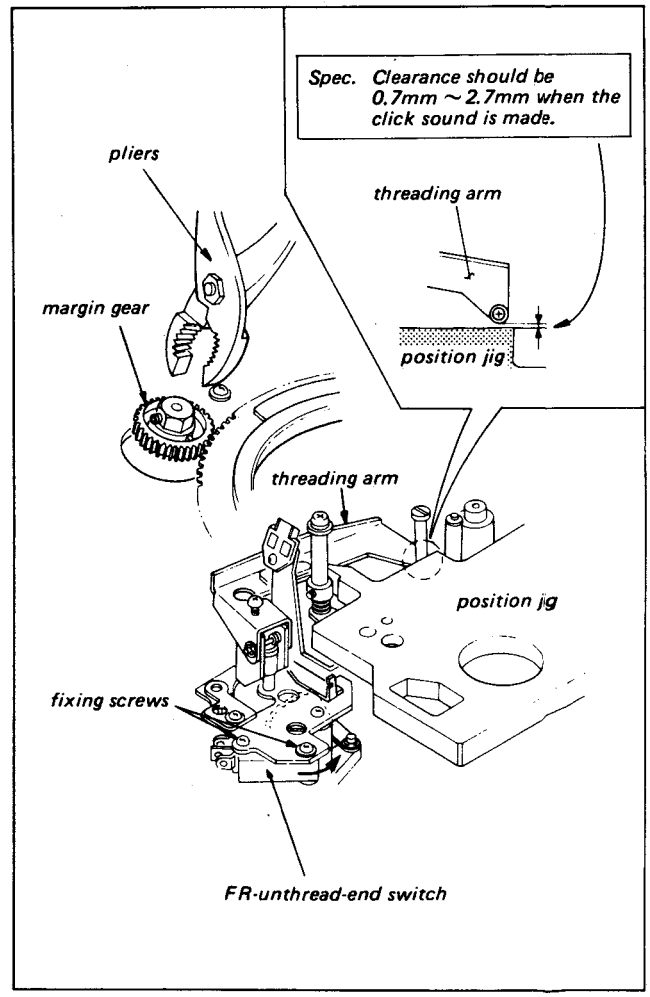
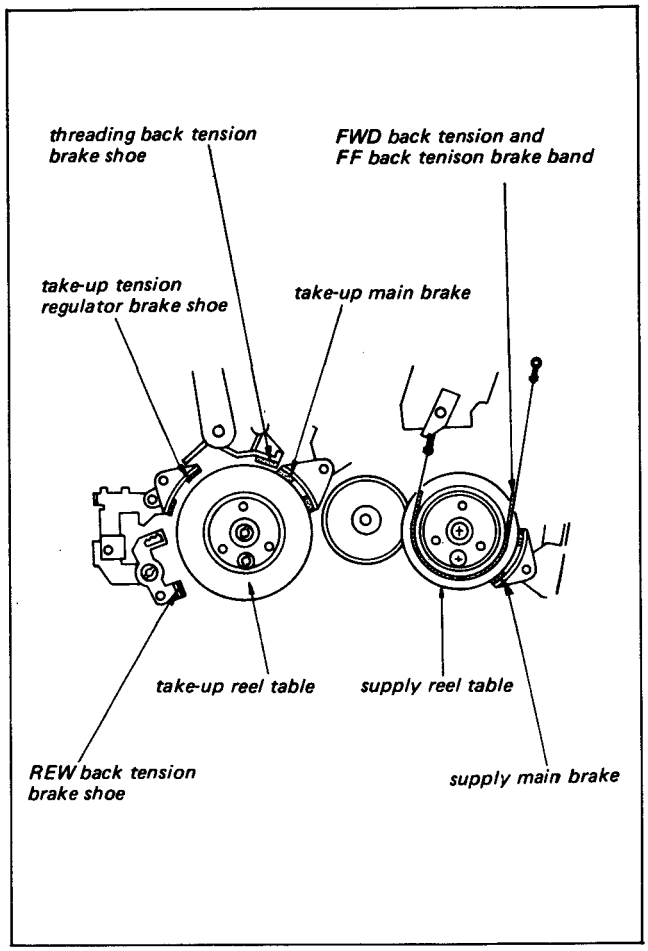


Fig. 4-14. FR Unthread-End switch position adj. (EJECT mode)

4-4. BRAKE SYSTEM ADJUSTMENT

- This machine has the supply reel table main brake and the take-up reel table main brake. Other various brake shoes for various back tension contacts the supply or take-up reel table depending on each operating mode as follows.

Mode \ Reel table	Take-up reel table	Supply reel table
Cassette-up (EJECT completed)	Only "threading back tension" brake shoe is ON.	Only "supply main brake" is ON.
Cassette-in ⟶ FR-STOP	Only "threading back tension brake shoe is ON. (Take-up reel supplies the tape.)	Only "supply main brake" is ON.
FR-STOP mode	Only "take-up main brake" is ON.	Only "supply main brake" is ON.
During Threading	Only "threading back tension" brake shoe is ON. (Take-up reel supplies the tape.)	"Supply main brake" and "FWD back tension" brake band are ON.
During PLAY	Only "take-up tension regulator brake shoe is ON. (Takes up tape onto take-up side.)	Only "FWD back tension" brake band is ON.
During PAUSE	Only "threading back tension" brake shoe is ON.	"Main brake" and "FWD back tension" brake band are ON.
During still-adj. operation	Only "threading back tension" brake shoe is ON. (Takes up tape onto the take-up side.)	Only "FWD back tension" brake shoe is ON, during still-adj. knob is pushed.
During (Unthreading (threading completed ⟶ FR-STOP)	Only "take-up tension regulator brake shoe is ON. (Takes up tape onto the take-up side.)	Only "supply main brake" is ON.
During FF	Free (Takes up tape onto the take-up side.)	Only "FF mode back tension" brake band is ON. (Same as FWD back tension brake band.)
During REW	Only "REW back tension" brake shoe is ON.	Free (Takes up tape onto the supply side.)
FR-STOP ⟶ EJECT (Just before Ejects is completed.)	Only "take-up tension regulator" brake shoe is ON. (Takes up tape onto the take-up side.)	Only "supply main brake" is ON.


threading back tension brake shoe
FWD back tension and FF back tenison brake band
take-up tension regulator brake shoe
take-up main brake
take-up reel table
supply reel table
REW back tension brake shoe
supply main brake

4-4-1. S.Hold Lever Position Adj.

If the machine is left with this adjustment unfinished, the possible troubles are;

(i) The Take-up side main brake will not release from the Take-up Reel Table, during the period from FR-STOP to the EJECT.

(ii) The AC motor switch will not turn ON in the respective modes indicated in the above paragraph (i).

1. Without threading cassette, put the machine into the FWD mode.
2. Check to see that the clearance A is 0 ~ 0.2 mm as shown in Fig. 4-15.

   If the required clearance cannot be observed, loosen the screw shown in Fig. 4-15 and adjust the S.hold lever in the directions shown by the arrow in Fig. 4-15 while pushing the S.hold arm towards the main ring.

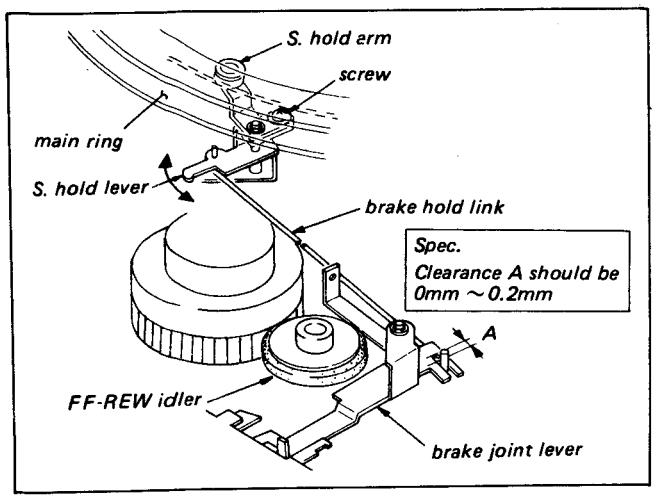


Fig. 4-15. S.Hold lever position adj. (FWD mode without tape)

4-4-2. Supply Reel Table, Brake Torque Adj.

If the Supply side brake torque is low, possibility of the tape damage trouble increases in the unthreading mode, because tape is fed from the Supply Reel Table so that the scars on tape can be given by the Threading Arm's Top Flange.

1. Without threading tape, put the machine into the EJECT mode.
2. Grasp the top of the Supply Reel-Table with fingers. Check to see the clearance of 0.3 mm ~ 0.5 mm shown in Fig. 4-16 as it is turned (↻) clockwise approx. 30 degrees. Correct clearance is 0.3 mm ~ 0.5 mm. If not, adjust it by bending the Supply Brake Lever shown in Fig. 4-16.

   If there is no clearance, the brake shoe will not be engaged with the reel table.

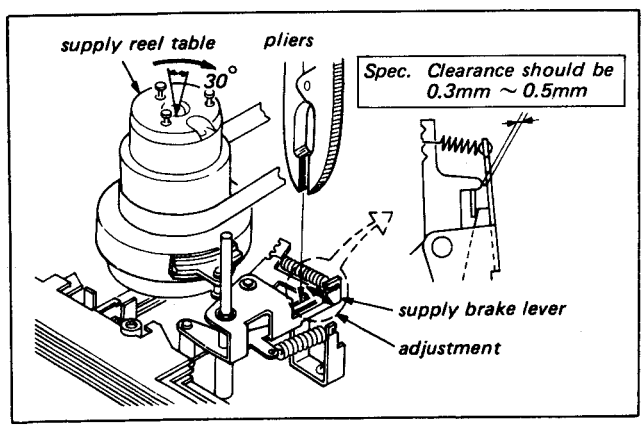


Fig. 4-16. Supply reel-table, brake torque adj. (EJECT mode)

3. Install a 100 mm diameter dummy reel pack tape (Jig Ref. No. J-7) on the Supply Reel-Table as shown in Fig. 4-17.
4. Hook a tension scale (200 g full scale) (Jig Ref. No. J-17) on an end of the dummy reel pack tape. Pull out the tape at the constant speed of approx. 9.5 cm/sec in the direction shown in Fig. 4-17. Scale reading should be 100 g ~ 130 g (x 5 cm).
5. Select a proper spring hook that provides tension scale reading of 100 g ~ 130 g (x 5 cm).

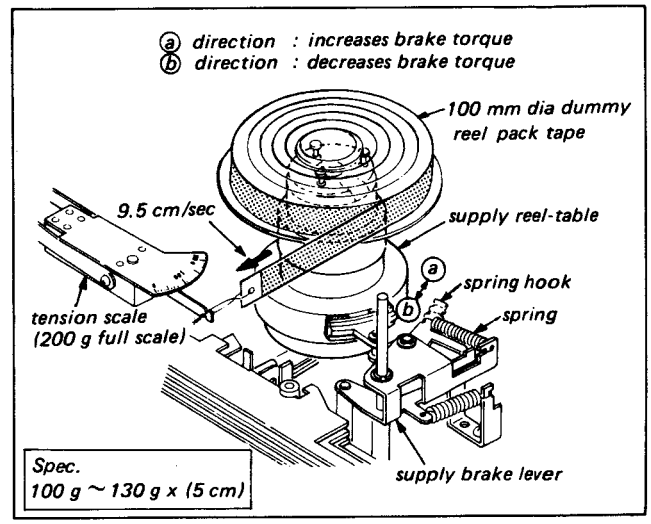


Fig. 4-17. Supply reel-table brake torque adj. (EJECT mode)

4-4-3. Take-up Reel Table, Brake Torque Adj.

1. Without threading tape, put the machine into the FR-STOP mode.
2. Grasp the top of the Take-up Reel-Table with fingers. Check to see the clearance of 0.3 mm ~ 0.5 mm shown in Fig. 4-18 as it is turned (↻) clockwise approx. 30 degrees. If not, adjust it by bending the Take-up Brake Lever, shown in Fig. 4-18.

   If there is no clearance, the brake shoe will not be engaged with the reel table.
3. Install a 100 mm diameter dummy reel pack tape (Jig Ref. No. J-17) on the Take-up Reel-Table as shown in Fig. 4-19.
4. Hook a tension scale (200 g full scale) (Jig Ref. No. J-17) on an end of the dummy reel pack tape. Pull out the tape at the constant speed of approx. 9.5 cm/sec in the direction shown in Fig. 4-19 scale reading should be 100 g ~ 130 g (x 5 cm).
5. Select a proper spring hook that provides tension scale reading of 100 g ~ 130 g (x 5 cm).

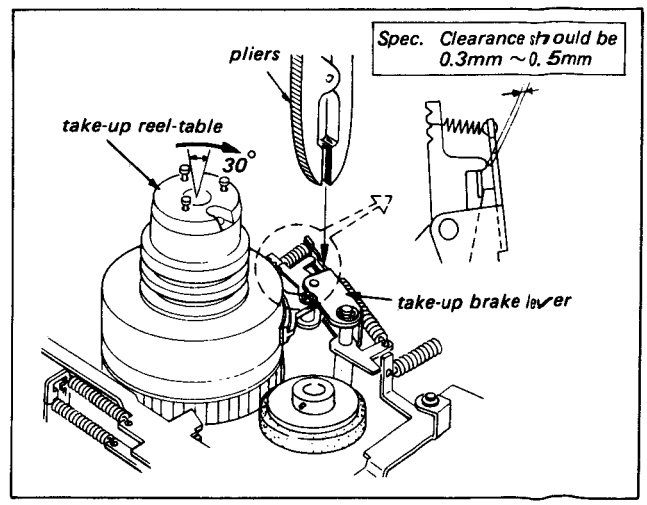


Fig. 4-18. Take-up reel-table brake torque adj. (FR-STOP mode without tape)

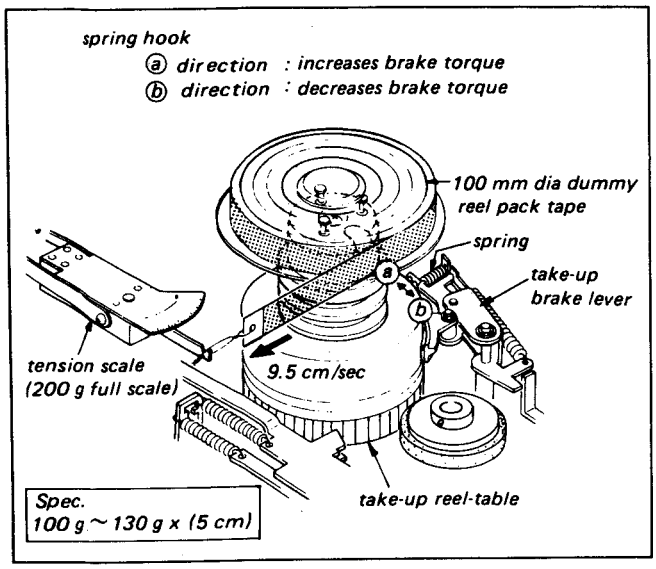

spring hook
ⓐ direction : increases brake torque
ⓑ direction : decreases brake torque
100 mm dia dummy reel pack tape
spring
take-up brake lever
tension scale (200 g full scale)
9.5 cm/sec
take-up reel-table
Spec.
100 g ~ 130 g x (5 cm)

Fig. 4-19. Take-up reel-table brake torque adj. (FR-STOP mode without tape)

4-4-4. Supply Brake Release Adj.

If this adjustment is incorrect, the Supply Reel-Table Brake is not released in the FWD or REC modes so that the too high the back tension may collapse the picture on the monitor.

1. Without threading tape, put the machine into the FWD mode.
2. Check to see that the clearance Ⓐ in Fig. 4-20, between the S-Brake Lever shaft and Link (F) is 4 mm ~ 4.5 mm. If not, adjust it by moving the Supply Brake Release Lever-A with an 4 mm diameter eccentric screwdirver (Jig Ref. No. J-5)
3. Repeat the PAUSE ⟷ FWD modes several times and confirm the clearance.

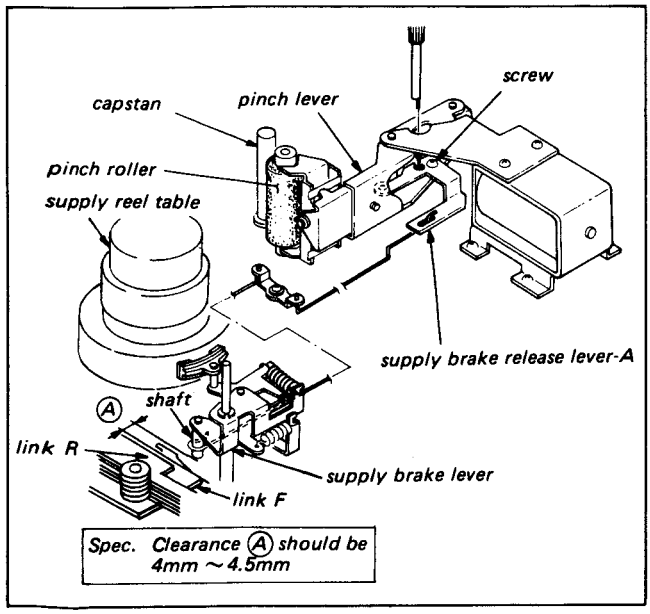


Fig. 4-20. Supply brake release adj. (FWD mode without tape)

4-5. TENSION REGULATOR POSITION ADJUSTMENT

4-5-1. Supply Tension Regulator Position Adj. (FWD MODE)

1. Without threading tape, put the machine into the FWD mode.

<CAUTION>

Never turn OFF power. If power is turned OFF, the Supply Tension Regulator Pin will be forced to lock in that the FR-STOP position.

2. Check to see that the clearance between the Supply Tension Regulator Pin and the top flange of the Tape Guide-II on the Erase Head Base should be in between 7.7 mm and 8.1 mm. If not, loosen the screw shown in Fig. 4-21 and adjust the position of the Brake Band Bracket.
   estimate of 8mm clearance: Use the Reel Table Height, Adj. Jig. (Jig Ref NO. J-14) as a thickness gauge because this jig has 8 mm thickness.

When this adjustment is attempted, perform the checks of the various values given in the following sections.

Sec. 5-2. FORWARD mode tape hold-back tension adj.
Sec. 5-4. F.Forward mode tape hold-back tension adj.
Sec. 6-5. FF-REW tape run adj.
Sec. 6-6. FORWARD mode tape run adj.

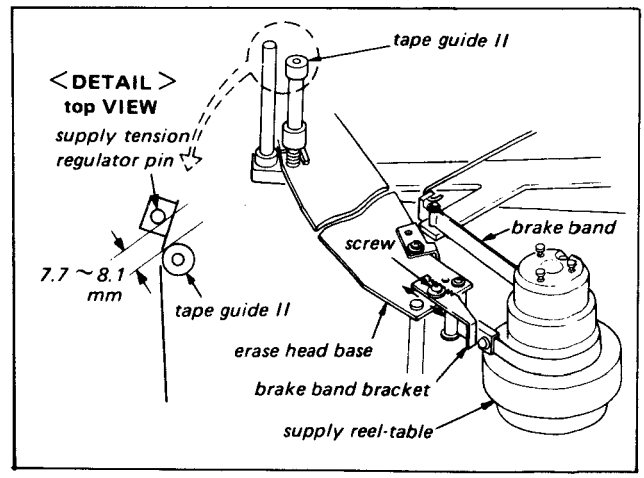


Fig. 4-21. Tension regulator pin position adj. (FWD mode) (FWD mode without tape)

4-5-2. Take-up Tension Regulator Operating Position Adj.

- If the Take-up Tension Regulator Operating Position is incorrect, possible trouble of the machine is that the machine's mechanism cannot effectively control the tape tension, especially at the beginning of a reel of tape, so that an abnormally high tension will applied to tape and damages a tape. Even not in an extreme of tape damage, an incorrect T.Tension Regulator Operating Position makes impossible to take-up a tape at a constant tape tension so that tape is adversely affected.
- The Take-up Tension Regulator's Brake Shoe will wear out with elapsed time of machine operating hour. It is requested that check-out of Brake Shoe wearing is made when a machine comes into stop for repair.

1. Turn on the power. Without inserting a cassette tape, put the machine into the FWD mode while maintaining POWER ON. (Never turn OFF POWER that disables the tension regulator at all.)

2. Push the T.Tension Regulator fully to the left (in Ⓐ direction) with finger as shown in Fig. 4-22 as far as it will go. Remove the finger gently from the T.Tension Regulator so that the T.Tension Regulator will slowly and naturally move to the right (in the Ⓑ direction).

3. Measure the movable distance of the T.Tension Regulator from the position established by step 2, to the position where the T.Tension Regulator is blocked by the Stopper, shown in Fig. 4-22. Practical procedure of measurement. Measure the distance how far the T.Tension Regulator moves when it is pushed by a finger to the right (in Ⓑ direction) until it is blocked by the Stopper from the position established by step 2. The movable distance should be 0.05 mm to 0.1 mm. If not, adjust the location of the P.Tension Regulator Stopper with use of 4 mm diameter eccentric screw driver (Jig Ref. No. J-5).

- Knack of this adjustment is to realize the purpose of this adjustment. Locate the Stopper beneath the T.Tension Regulator. This Stopper is shaped as ⌊⎯⌋ that determines the operating position of the T.Tension Regulator. Purpose of this adjustment is position the Stopper so that the T.Tension Regulator can make full use of the total length of the Stopper by moving from its left end to the right end.

4. After completing the adjustment, perform sec. 5-6 Overall Take-up Torque Measurement.

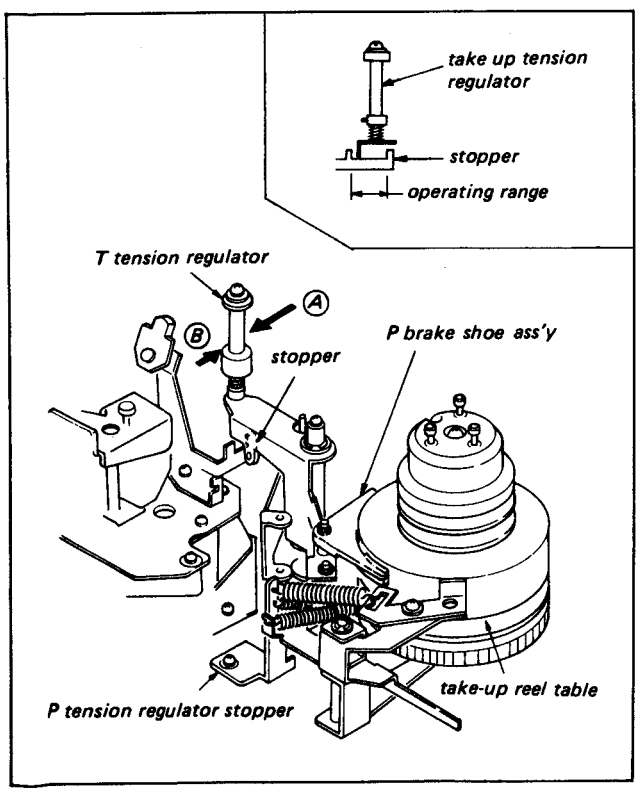


Fig. 4-22. T.tension regulator operating position adj. (Be sure POWER ON, in FWD mode without cassette.)

4-5-3. R.Tension Regulator Position Adj.

- If the R.Tension Regulator is left un-adjusted in the incorrect position, a constant hold-back tension on tape cannot be applied in the REW mode so that adverse effect on tape will result.

1. Without threading tape, put the machine into the REW mode, while maintaining POWER ON. (Never turn OFF POWER that disable the tension regulator at all.)

2. Push the T.Tension Regulator fully to the left (in Ⓐ direction) with finger as shown in Fig. 5-28 as far as it will go. Remove the finger gently from the T.Tension Regulator so that the T.Tension Regulator will slowly and naturally move to the right (in the Ⓑ direction).

3. Measure the movable distance of the T.Tension Regulator from the position established by step 2, to the position where the T.Tension Regulator is blocked by the Stopper, shown in Fig. 4-22. Practical procedure of measurement. Measure the distance how far the T.Tension Regulator moves when it is pushed by a finger to the right (in Ⓑ direction) until it is blocked by the Stopper from the position established by step 2. The movable distance should be 0.05mm to 0.1mm. If not, adjust the location of the T.Tension Regulator Stopper with use of 4mm diameter eccentric screw driver (Jig Ref. No. J-5)

   If not, adjust the position of the R.Tension Regulator Arm with a 4 mm diameter eccentric screwdriver (Jig Ref. No. J-5).

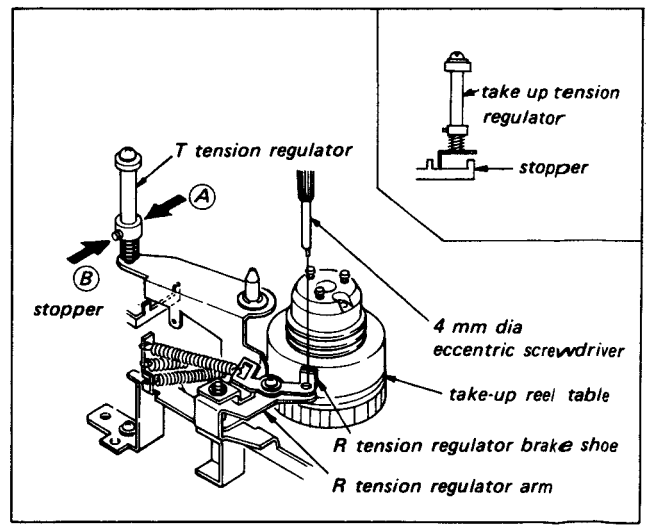


Fig. 4-23. R.tension-regulator position adj. (REW mode without tape)

4-5-4. Supply Tension Regulator Stopper Position Adj.

If the Supply Tension Regulator Stopper Position is incorrect, there is a danger that the Supply Tension Regulator Arm starts without drawing the tape of the cassette.

1. Without inserting cassette, put the machine into the FR-STOP mode.

2. Install the Position Jig (Jig Ref. No. J-13) as shown in Fig. 4-24.

3. Put the machine into the EJECT mode.

4. Check to see that two requirements are simultaneously met at Ⓐ and Ⓑ portions in Fig. 4-24.

Requirement-1 ; When Ⓐ is in contact, Fig. 4-25, Ⓑ should be in contact or the clearance should be less than 0.2 mm.

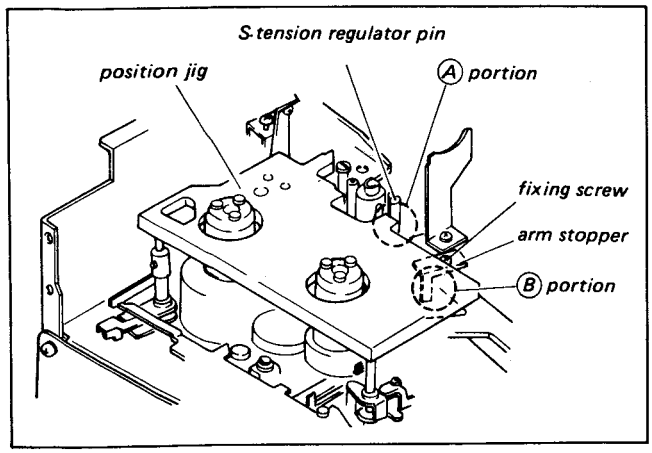


Fig. 4-24. Supply tension regulator stopper position adj. (EJECT mode without tape)

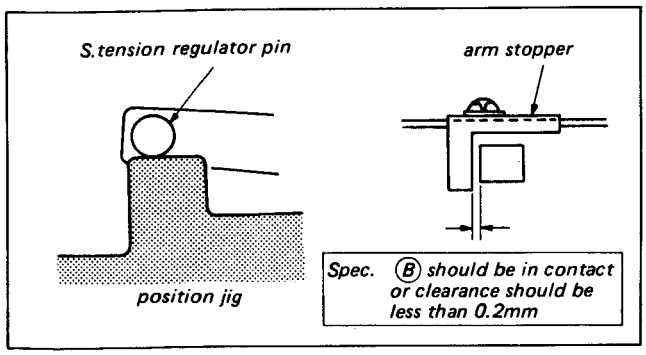


Fig. 4-25. When Ⓐ portion is in contact

Requirement-2; When Ⓑ is in contact, Fig. 4-26, Ⓐ should be in contact, or the clearance should be less than 0.3 mm.

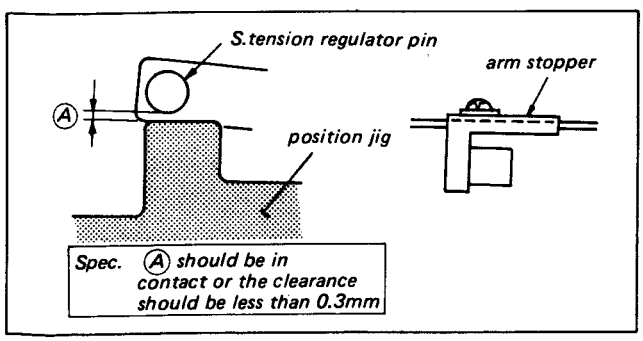


Fig. 4-26. When Ⓑ portion is in contact

If the above two requirements cannot be met, proceed to the step 5.

5. Loosen the fixing screw of the Arm Stopper referring Fig. 4-24. Adjust the Arm Stopper to meet the two requirements in step 4.

4-5-5. Supply Tension Regulator Position Adj. (REW Mode)

If this portion of the mechanism is showing incorrect operation, the Supply Tension Regulator will vibrate in the starting period of the REW mode so that the prospective trouble may be unstable tape running in the REW mode. (When this portion of the mechanism is operating correctly, the Supply Tension Regulator will move only 1mm during rewind.)

<CHECK procedure>

1. Without threading tape, put the machine into the FR-STOP mode
2. Prepare 200g-full-scale tension scale. Hold the tension scale with hand and push the Supply Tension Regulator Pin with top end of the tension scale probe to the reel table, and showing 100g. If the Supply Tension Regulator Pin moves more than 1mm when pushed with 100g. proceed to step 3, adjustment.

<ADJUSTMENT procedure>

3. Without threading tape, put the machine into the FR-STOP mode.
4. Loosen the fixing screws "A" and "B" 1/2 turns as shown in Fig. 4-27.
5. Set the screwdriver with gear (Jig Ref. No. J-21) to the hole of tension regulator connecting link.
6. Once turn the screwdriver with gear to counter-clockwise direction (↺).
7. Turn the screwdriver with gear to clockwise direction (↻) until to move the Stop Lever in the direction shown by arrow in Fig. 4-27.
8. Tighten the two fixing screws.
9. After this adjustment, perform the sec. 6-5 F-Forward and Rew mode Tape Run Adj.

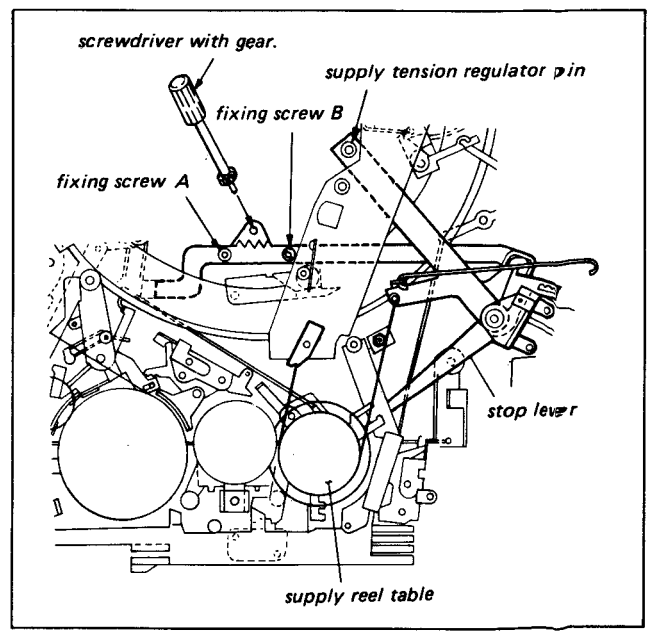


Fig. 4-27. S.tension regulator position adj. (REW mode) (FR-STOP mode without tape)

4-5-6. Supply Tension Regulator Pin Movable Range Adjustment (FF Mode)

- If this adjustment value is less than 0.5 mm, the prospective trouble is that the tape hold-back tension becomes weak during the Fast Forward mode.
- If this adjustment value is in contrary, more than 2 mm, the possible trouble is that the Main Solenoid does not fully energize that drives all the mechanism into the Fast Forward position.

1. Without threading tape put the machine into the F.F. mode. mode.
2. Check to see that the clearance (A) in Fig. 4-28, between the Stop Lever and the F-F Lever is 0.5mm ~ 2.0mm. If not, adjust it by bending the F-F Lever.

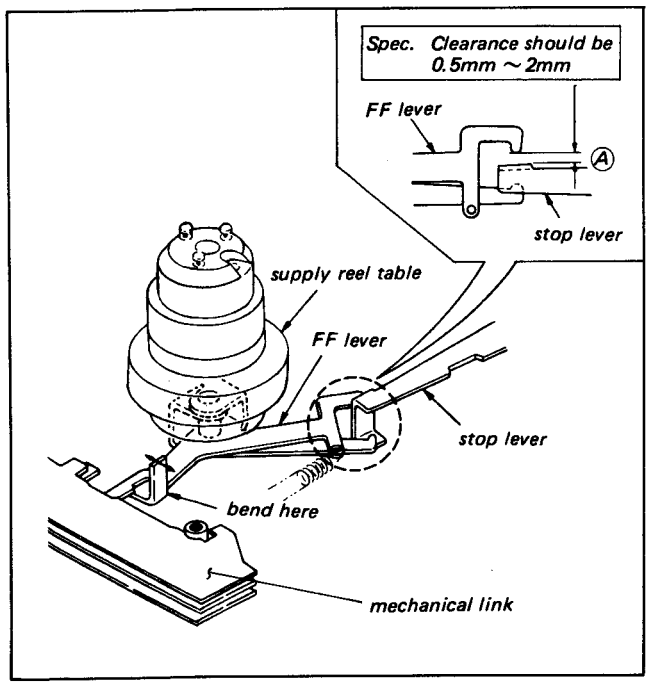


Fig. 4-28. Supply tension regulator pin movable range adj. (FF mode without tape)

4-6. TAPE THREADING SYSTEM ADJUSTMENT

4-6-1. Threading Ring Rotation Adj.

- If the Threading Ring is left unadjusted to have narrower clearance, the Ring rotation becomes heavy' or if left to have wider clearance, tape run during threading and during normal FWD modes will be unstable.
- This adjustment is required only when the Threading Ring is replaced or removed. It is usually not required. The Erase Head Base should be temporarily removed during the course of this adjustment.

1. Put the machine into the FR-STOP mode.
2. Check to see that the play in the horizontal direction of the Threading Ring is 0.2mm ~ 0.6mm.
3. Check to see that the rotation of the Threading Ring into the threading and unthreading modes are smooth.
4. If steps 2 and 3 requirements are not met, locate the Erase Head Base and locate then the Ring Roller Bracket beneath the Erase Head Base. Insert a 0.3 mm thick paper between the Ring Roller and the Threading Ring. Paper of this service manual is 0.1 mm thick so that the three fold becomes 0.3 mm thick. Adjust then the Ring Roller Bracket position for approx. 0.3 mm.
5. Perform the following adjustment.

   sec. 4-5-1. Supply Tension Regulator Position Adj. (FWD mode)
   sec. 5-2. FWD mode, Tape Hold-back Tension Adj.
   sec. 5-4. FF mode, Tape Hold-back Tension Adj.

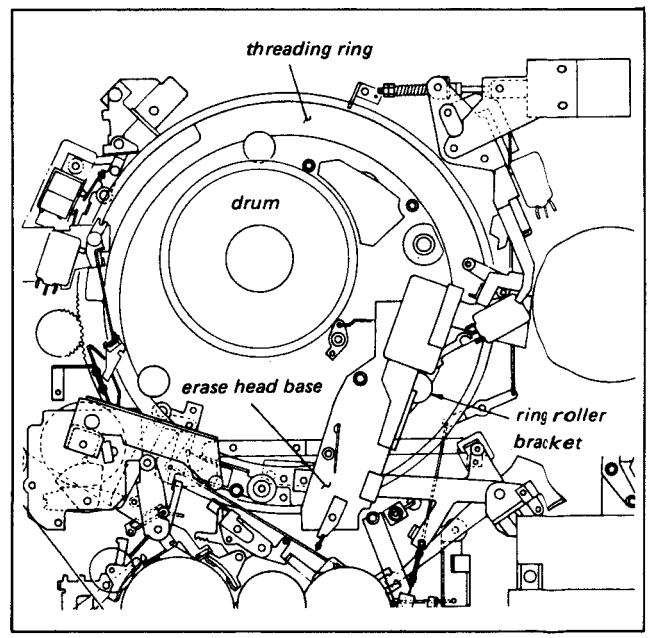


Fig. 4-29. Threading ring rotation adj. (FR-STOP mode without tape)

4-6-2. Gear Box Position Adj.

- It is required that the sec. 4-6-1 Threading Ring Rotation Adj. is checked to be correct or properly adjusted before initiating this adjustment.
- This adjustment is required only when a Gear Box is removed and is then installed into the machine. It is not required in usual maintenance.
- The following adjustment procedure begins in the state of a machine that a Gear Box is already removed earlier.

1. Without threading tape, put the machine into the FR-STOP mode and turn the POWER OFF.
2. Turn the Gear of the Threading Arm Ass'y in the counter-clockwise direction as far as it turns with finger tip as shown in Fig. 4-30.
3. Install the Margin Gear on the Gear Box Shaft. Do not tighten the screws.
4. Mount the Gear Box Ass'y to the slant chassis from rear of the machine. When mounting the Gear Box Ass'y, bring the assembly so that the Margin Gear and the Threading Ring are engaged.

Install the Gear Box Ass'y so that about 0.2 mm ~ 0.3 mm clearance exists in B direction between the Margin Gear and the Threading Ring while pressing the Ass'y all the way in the A direction as shown in Fig. 4-30. Tighten the two fixing screws, marked C and D.

5. Turn the Threading Ring with finger until the Pinch Roller is positioned in the EJECT position.
6. Turn the POWER SW ON, put the machine into the EJECT mode by pressing the EJECT button.
7. Tighten the fixing screw E.
8. Adjust the Margin Gear Position referring sec. 4-3-1 Margin Gear Position Adj.

After this adjustment perform the following adjustments.

sec. 4-3-2 ; Threading Arm Stopper Position Adj.
sec. 4-3-3 ; FR Unthread-End Switch Position Adj.

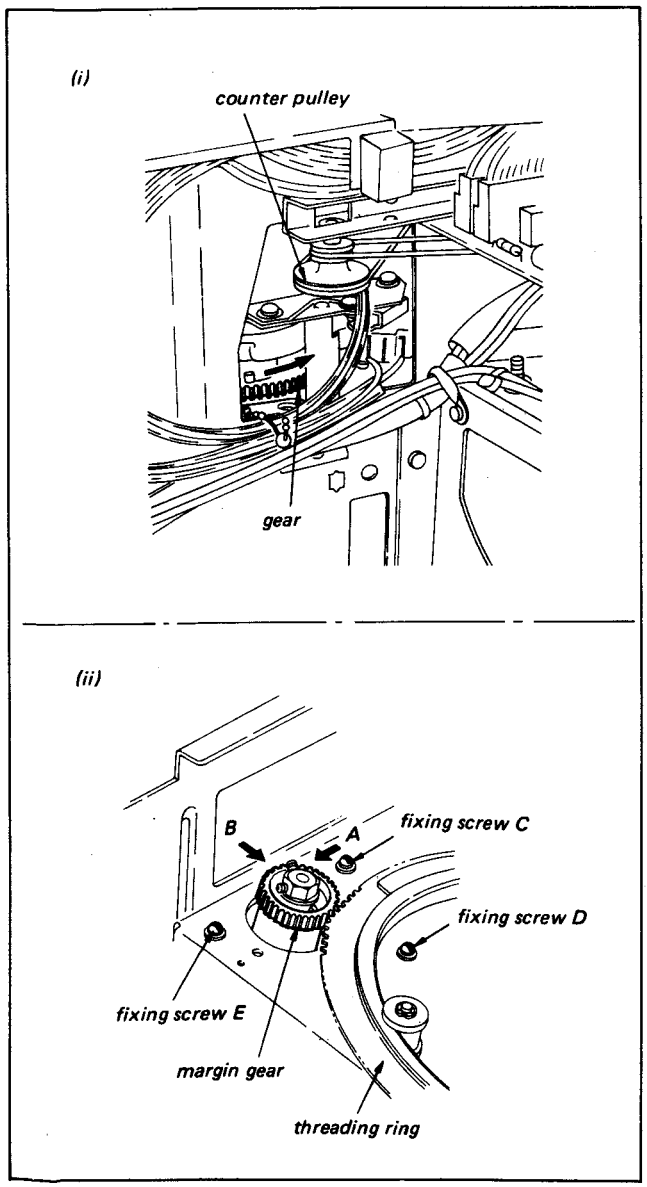


Fig. 4-30. Gear box position adj.

4-7. SWITCH SYSTEM ADJUSTMENT

4-7-1. AC Motor SW Position Adj.

- If the AC Motor Switch position is left in an incorrect position, the possible trouble is that a AC Motor will not start turning even after any of the function button is pressed. Another possible trouble is that the AC Motor will not stop turning even the machine is put in the FR-STOP mode.

1. Put the machine into the EJECT mode.
2. Turn the POWER OFF, and push the Brake Link Lever slowly in the direction indicated by an arrow A, in Fig. 4-31. And check to see that the traveling distance is more than 5 mm after the AC Motor Sw is turned ON. If not, adjust the AC Motor Sw position.
3. Push the Brake Link Lever slowly in the direction by an arrow A so that the AC Motor Sw in turned ON, and then reversely move it to it's original position. Check to see that there are clearances in C and D of Fig. 4-31. (C is the clearance between the Brake Link Lever and the Actuator, D is the clearance between the Actuator and section E of the microswitch.) If not, re-adjust the step 2.
4. Check to see that the Grease is lubricated on the Actuator where is contacting the Brake Link Lever.
   If not, lubricate the light Grease (recommended the SONY GREASE, part No. 7-662-001-22 or 7-662-001-41) on the Actuator. Don't apply oil.

<CAUTION>

Never apply grease on the actuator's micro-switch contacting side.

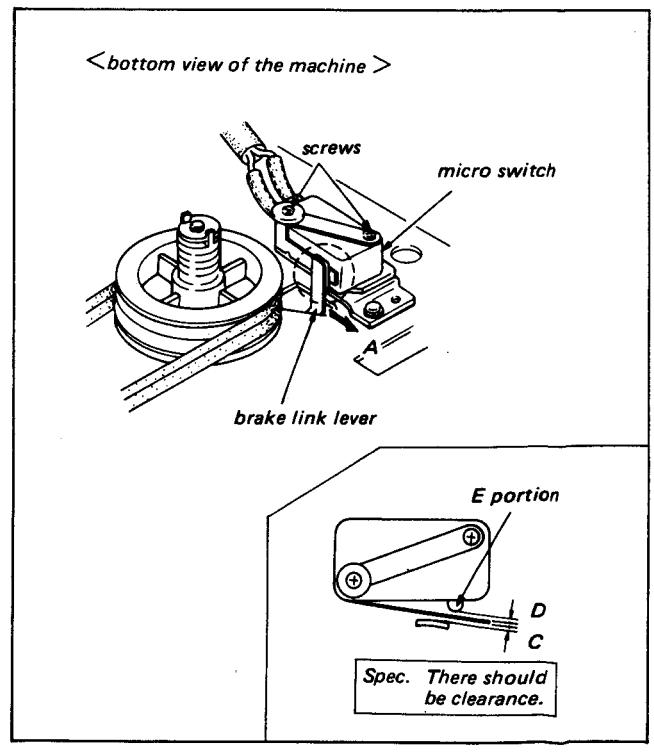


Fig. 4-31. AC motor SW position adj. (Power OFF and EJECT mode)

4-7-2. Cassette-up Switch Position Adj.

- If the Cassette-up Switch Position is incorrect, tape threading will not start in the moment of cassette insertion.

1. Put the machine into EJECT-completed state.
2. Push the Lock Lever with finger in the arrow direction shown in Fig. 4-32 as far as it will go. Observe clearance between micro-switch side face and the Lock Lever at around the sensing protrusion of the micro switch.
   The clearance of 0.4 mm to 0.8 mm should be observed. If not, adjust the mounting position of the micro switch.

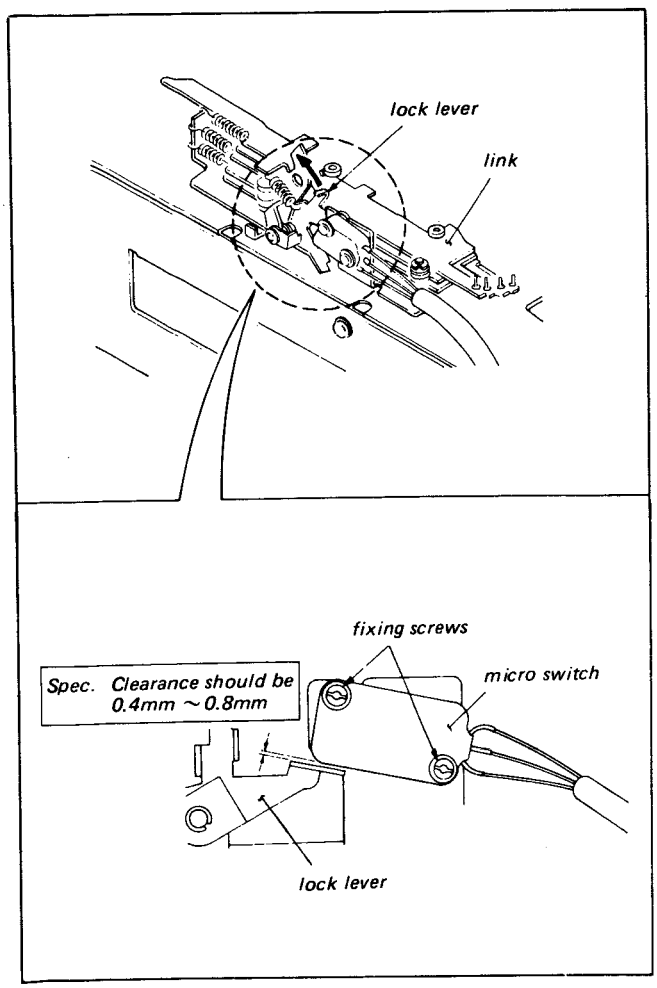


Fig. 4-32. Cassette-up switch position adj. (EJECT mode)

4-8. STILL-ADJUST ADJUSTMENT

- This machine has the STILL-ADJUST mechanism that has claw (called as the ST Cam) which turns the Supply side reel-table as the STILL-ADJUST knob is pulled in the STILL mode. The tape is supplied from the Supply side reel-table for a certain amount of tape that is taken-up by the Take-up reel-table. This claw should be normally detached from the Supply reel-table in other modes of the PLAY, F.FWD, REW and EJECT modes. However, if this STILL-ADJUST mechanism is incorrect, the possible trouble is that the claw keeps contacting the Supply side reed-table even in the PLAY mode to cause buzzing noise.

4-8-1. ST Cam Postion Adj.

<Check Procedure>

1. Without threading tape, put the machine into the PLAY mode.
2. While the machine is in the PLAY mode, hold the Supply Reel-Table with fingers. Turn the Supply Reel-Table 180 degree in the clockwise direction with finger and check that the buzzing noise is not generated from the lower portion of the Supply Reel-Table. (The FWD Back Tension's Brake Band only is working on the Supply Reel-Table in this state.) If sound is heard, adjust in accordance with step 4.
3. Press then the PAUSE button to put the machine into the STILL mode. Check to see that the Supply Reel-Table turns approx. 2 degrees in clockwise as the STILL ADJUST knob is pulled. If the Supply Reel-Table does not turn even though the STILL ADJUST knob is pulled, proceed to the step 4 for adjustment.

<Adjustment Procedure>

4. Without threading tape, put the machine into the PLAY mode.
5. Adjust position of the Adj. Plate shown in Fig. 4-33 in the direction shown with screw driver tip so that clearance between tip of the ST Cam and surface of the Supply Reel-Table is 1 mm ~ 2.5 mm as observed by eye.
6. Detach the black colored vynil insulation tape that is temporarily attached on the two phototransistors. Playback a KCA-type or KCS-type (still possible) pre-recorded tape and observe the playback picture in STILL mode. Check to see that guard band noise on the monitor screen shifts showing that STILL-ADJUST is possible as the STILL-ADJUST knob is pulled.

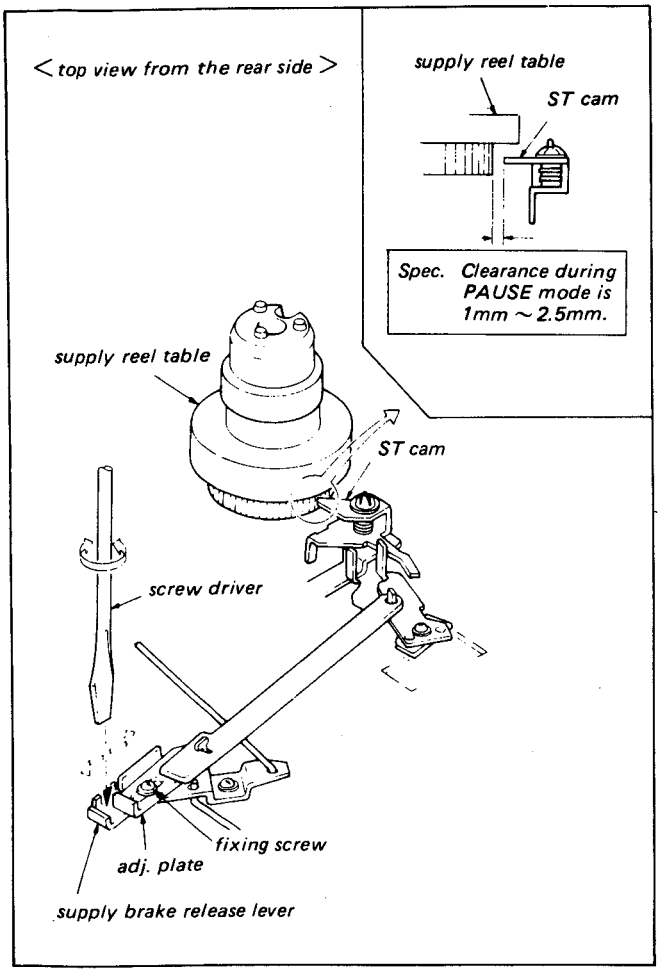


Fig. 4-33. STILL ADJUST adjustment (PLAY mode without tape)

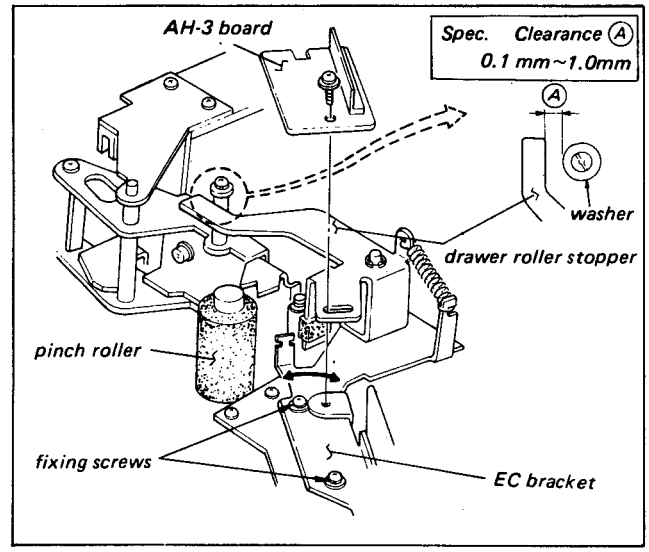


Fig. 4-34. Roller stopper position adj. (PAUSE mode without tape)

4-8-2. Roller Stopper Position Adj.

If this adjustment is incorrect, the still noise on the monitor flows from up to down.

< Check Procedure >

1. Without threading tape, put the machine into the PAUSE mode.
2. Check to see that the clearance exists between the Drawer Roller Stopper and the Washer on top of the collar, for 0.1 mm~1.0 mm. If not, adjust as follow.

< Adjustment Procedure >

3. Remove the AH-3 board on the Erase Head Base.
4. Adjust the position the of EC bracket in the arrow direction.

4-8-3. Roller Stopper Stroke Adj.

If the Roller Stopper Stroke is incorrect, still adjust motion does not operate in the STILL ADJ. mode.

< Check Procedure >

1. Without threading tape, put the machine into the FR-STOP mode.
2. Check to see that two requirements are simultaneously met at Ⓐ and Ⓑ portion.

<Adjustment Procedure >

3. Bend the Release Lever Ⓓ portion on the function block with pliers to satisfies the specifications.

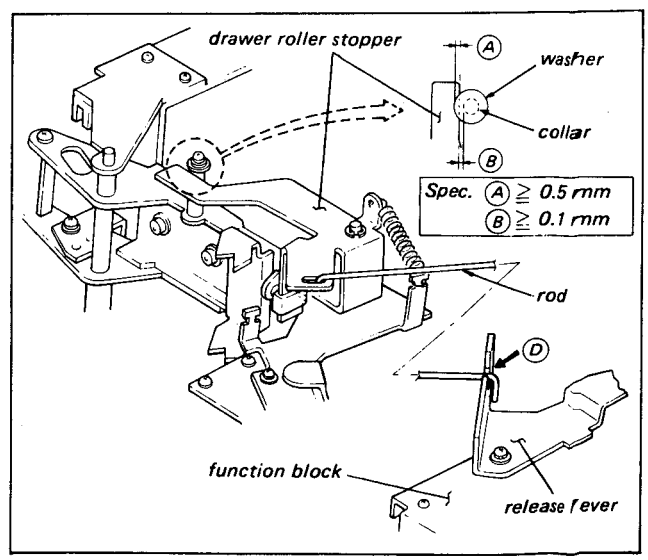


Fig. 4-35. Roller stopper stroke adj. (FR-STOP mode without tape)

SECTION 5
BACK TENSION AND TORQUE ALIGNMENT

5-1. THREADING BACK TENSION ADJUSTMENT

- If the Threading Back Tension is high, the tape-to-head contacting pressure becomes abnormally high so that the possible trouble is to give scars (trace scar) on tape due to video heads. The machine having the auto-repeat feature performs the tape threading at a certain same portion of a tape so that the specific portion of the tape is damaged very easily.
- If the Threading Back Tension is low, tape provides an extra slack in an occasion of cassette-in and results in possible trouble of tape threading error, or trouble of no still picture in still mode due to insufficient tape-to-head tension.

1. Without threading tape, put the machine into the EJECT mode. (Only the Threading Brake is ON upon the Take-up Reel Table.)
2. Install a 100 mm diameter dummy reel pack tape (Jig Ref. No. J-7) on the Take-up Reel-Table.
3. Hook a tension scale (50 g full scale) (Jig Ref. No. J-15) on an end of dummy reel pack tape. Pull out the tape at the constant speed of approx. 9.5 cm/sec in the direction shown in Fig. 5-1. Scale reading should be 15 g ~ 25 g (x 5 cm).
4. If incorrect, adjust by bending the spring hook for 15 g ~ 25 g.
5. Clean all the parts/components that contacts with the brake shoe of the reel table with cloth moistened with methanol. After cleaning, check the tension again of step 4 for confirmation.

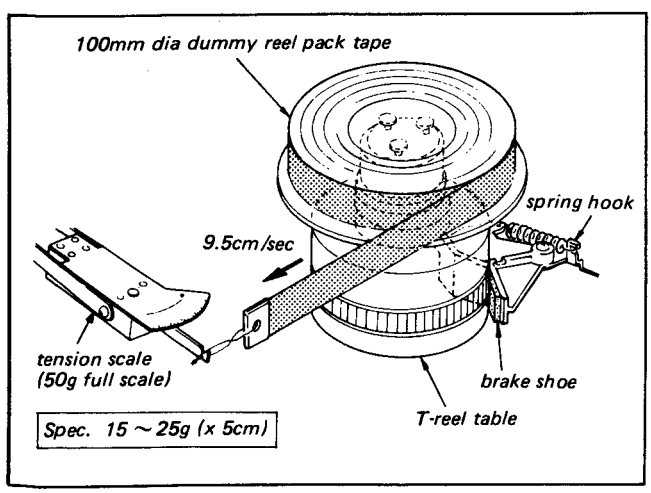


Fig. 5-1. Threading back tension adj. (EJECT and power OFF mode)

5-2. FORWARD MODE, TAPE HOLD-BACK TENSION ADJUSTMENT

- This adjustment is required whenever replacement of the Brake Band, Supply Reel-Table or Supply Tension Regulator is made or adjustment of the Supply Tension Regulator Pin position adj. (FWD) is made.
- Check to see that sec. 4-5-1 Supply Tension Regulator Pin position adj. (FWD) is correct before initiating this adjustment.
- If this adjustment is incorrect to have lower tension than specified, good head-to-tape contact cannot be obtained so that one of possible troubles is fluctuation of chroma level on top of picture.

1. Without threading tape, put the machine into the FR-STOP mode. Install the FWD Back Tension Measurement Jig (Jig Ref. No. J-11) on the machine as shown in Fig. 5-2, with two screws.
2. Install the Back Tension Adj. Jig (Jig Ref. No. J-12).
3. Install a 38mm diameter dummy reel pack tape (Jig Ref. No. J-8) on the Supply Reel-Table as shown in Fig. 5-2. And thread the tape as shown in Fig. 5-2. (Tape should be wound around the reel hub in the clockwise direction of 38mm diameter reel pack.) Put the machine into the FWD mode.
4. Hook a tension scale (100 g full scale) (Jig Ref. No. J-16) on an end of tape and pull it at the constant speed of approx. 9.5 cm/sec speed in the direction shown by Fig. 5-2.
5. Check that the scale reading is 85 g ~ 90 g.
6. If the scale reading does not meet requirement, adjust the position of the SKEW spring hook with an eccentric screw driver (Jig Ref. No. J-5).
7. Put the machine into the FR-STOP mode and remove the FWD Back Tension Measurement Jig from the machine.

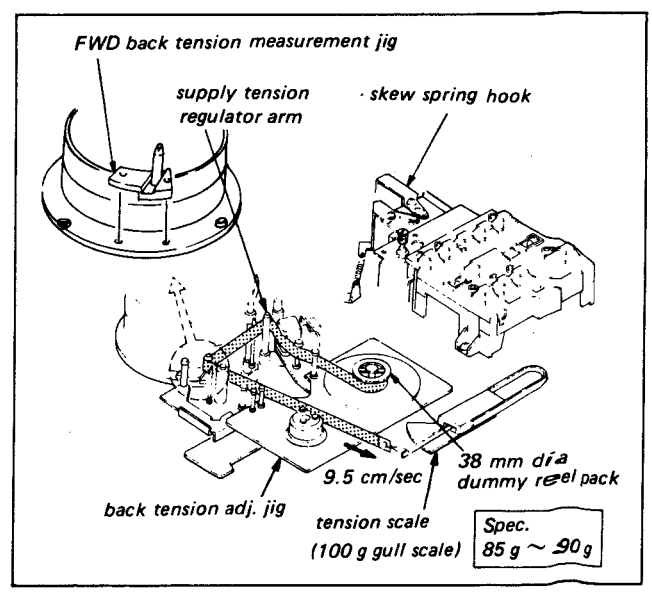


Fig. 5-2. FWD back tension adjustment (FWD mode)

<CAUTION>

Do not press the EJECT button with the FWD Back Tension Measurement Jig installed on the machine. If it should be pressed, the Threading arm of the machine's mechanism will collide with the Measurement Jig so that the Arm may bend. Be sure to remove the Jig before pressing the EJECT.

5-3. REWIND MODE, TAPE HOLD-BACK TENSION ADJUSTMENT

- This adjustment is required when the Take-up reel-table is replaced or REW Tension Regulator Arm is replaced, or Rew Tension Regulator position is adjusted.
- If this adjustment is left incorrectly higher value than specification, the possible trouble is that tape stopps running in REW mode, at the end of a reel of tape.
- If, oppositely, the Rewind Tape Tension is left lower than specifications, possible trouble is that the tape is wound around the reel-hub loosely which can result in so called "windowing" where window is produced between the tape loyers as tape happens to be pulled momentarily with big force in tape longitudinal direction.

1. Without threading tape, put the machine into the FR-STOP mode.
2. Install the Back Tension Adj. Jig (Jig Ref. No. J-12) on the machine as shown in Fig. 5-3.
3. Install a 100mm diameter dummy reel pack tape (Jig Ref. No. J-7) on the Take-up Reel-Table and thread the tape as Fig. 5-3.
   (The tape should be wound around the reel-hub of the 100 mm diameter reel-pack in clockwise direction).
4. Put the machine into the REW mode. Hook a tension scale (100 g full scale) (Jig Ref. No. J-16) on an end of the tape and pull it at the constant speed of approx. 9.5 cm/sec speed in the direction shown in Fig. 5-3.
5. Check to see that scale reading is 50 g ~ 70 g. If not, select proper position of the spring hook.

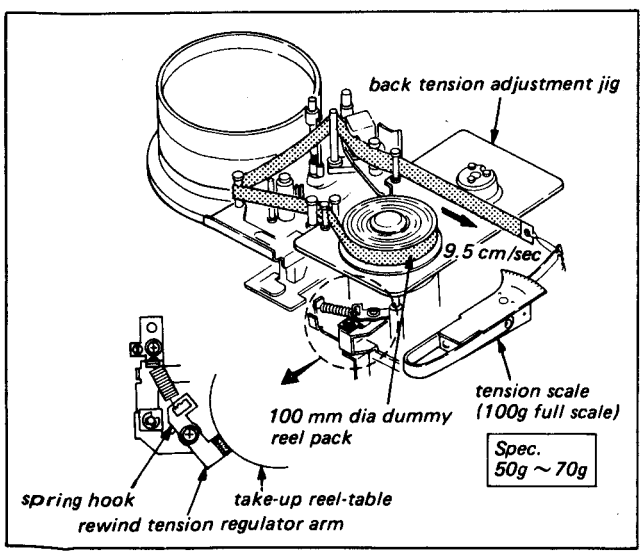


Fig. 5-3. Rewind back tension adjustment (REW mode)

5-4. FAST-FORWARD MODE, TAPE HOLD-BACK TENSION ADJUSTMENT

- This adjustment is required when replacement of Brake Band, Supply Reel-Table or Supply Tension Regulator is performed, or when the Supply Tension Regulator Pin Position Adj. (FWD) is made.
- Confirm the Section 4-5-1 Supply Tension Regulator Pin Position Adj. (FWD) is fully met or adjusted, before initiating this adjustment.
- If FF mode Tape Hold Back Tension is higher than the specified value, tape is wound around the Supply Reel-Table too tight, tape is adversely affected.
- If FF mode Tape Hold Back Tension is lower than the specified value, tape is wound around the reel-hub loose that can result in uneven tape winding when tape is pulled with strong force.

1. Without threading tape, put the machine into the FR-STOP mode.
2. Install the Back Tension Adj. Jig (Jig Ref. No. J-12) as shown in Fig. 5-4.
3. Install a 100mm diameter dummy reel pack tape (Jig Ref. No. J-7) on the Supply Reel-Table and thread the tape as shown in Fig. 5-4.
   (Tape should be wound around the reel-hub in the clockwise direction earlier.)
4. Put the machine into the F.FWD mode.
   Hook a tension scale (100 g full scale) (Jig Ref. No. J-16) on an end of tape and pull it at the constant speed approx. 9.5 cm/sec speed in the direction shown by Fig. 5-4.
5. Check to see that the tension scale reading is 80 g ~ 90 g.
   If not, adjust the position of the Cancel Spring hook with an eccentric screwdriver (Jig Ref. No. J-5).

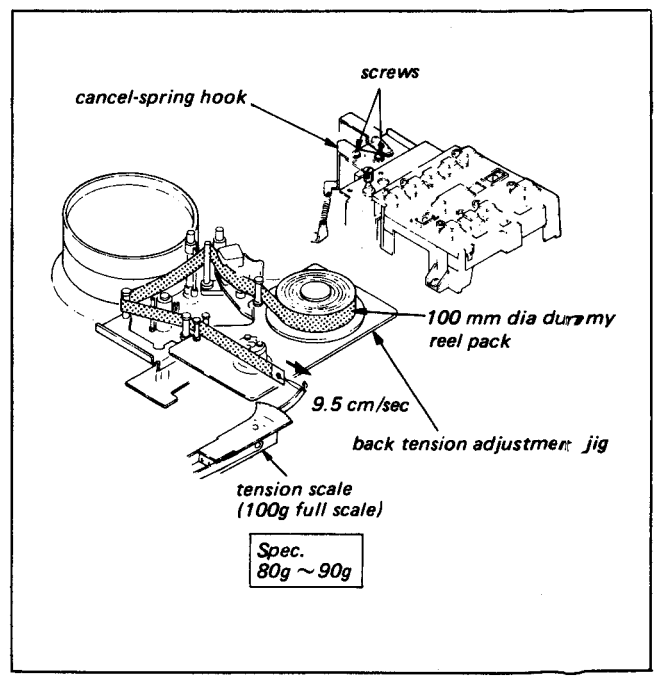


Fig. 5-4. F.FWD back tension adjustment (F.FWD mode)

5-5. FORWARD TORQUE CHECK (TAKE-UP REEL TABLE)

- If the Take-up Reel-table Forward Torque is higher than the specified value, the possible trouble is scars to be given to tape due to high tape tension, during the FWD mode (especially at tape beginning), and during the tape unthreading.
- If the Take-up Reel-table's Forward Torque is lower than the specified value, torque is not sufficient to take-up at the tape-end so that tape will have slack around the Capstan Shaft and activates the FWD Slack Switch.

1. Install a 100 mm diameter dummy reel pack tape (Jig Ref. No. J-7) on the Take-up reel-table as shown in Fig. 5-5.
2. Put the machine into the FWD mode.
3. Hook a tension scale (200 g full scale) (Jig Ref. No. J-17) on an end of tape and let the tape pulled at the constant speed approx. 9.5 cm/sec speed.
4. Check to see that tension scale reading is 85 g ~ 140 g (x 5 cm).
5. If not, replace the Take-up Reel-Table. Check the Reel-table height and vertical play by sec. 4-1. Proceed then to the torque check by step 1 through step 4.
6. When this adjustment is attempted, perform the checks of the various values given in the following section.

   5-6. Overall forward take-up torque check.

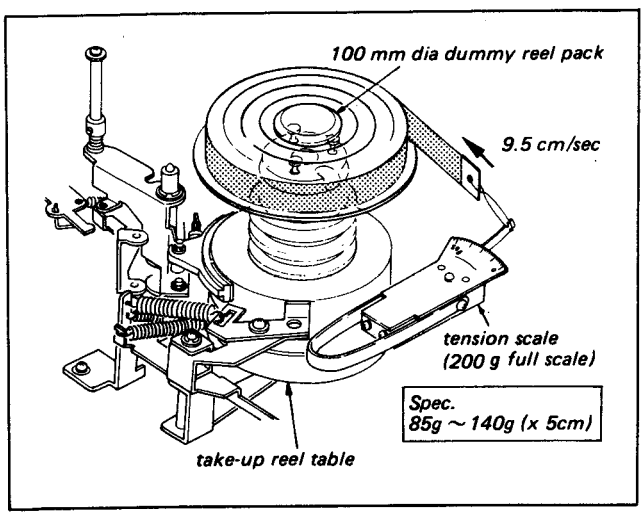


Fig. 5-5. FWD torque check (FWD mode)

5-6. OVERALL FORWARD TAKE-UP TORQUE CHECK

- This check/adjustment section measures the actual take-up torque to be applied to the tape, as a result of an entire mechanism system that controls the tape tension in the FWD mode. Since this tension control mechanism system comprises the Reel-table Torque, Reel-table surface conditions, Take-up Tension Regulator Operating Position, etc., this overall Forward Take-up Torque Check should be initiated after the Take-up Reel-table Take-up Torque (sec. 5-5) and the Take-up Tension Regulator Operating Position (sec. 4-5-2) are already finished earlier.
- If the overall Forward Take-up Torque is too high, the tape tension exceeds beyonds the controllable limit so that tape will have scars as the result, even though the Reel-table Take-up Torque and the T.Tension Regulator Operating Position are correct respectively.
- T.Tension Regulator Operating Position will change gradually with the elapsed time. It is requested to check the Overall Forward Take-up Torque whenever a machine comes into repair shop.

1. Install a 100 mm diameter dummy reel pack tape (Jig Ref. No. J-7) on the Take-up Reel-table as shown in Fig. 5-6.
2. Put the machine into the FWD mode.
3. Push the Take-up Tension Regulator to the LEFT as far as it goes.
4. While pushing the T.Tension Regulator to the LEFT, measure the Forward Torque in the same manner as sec. 5-5.
5. Check to see that the scale reading is less than 50 g (x 5 cm).
   - Scale reading of 0 g will do.
   - If scale reading has fluctuation, take the maximum value.
6. If the scale reading does not meet requirement, replace either one or both of the Take-up Reel-Table and its brake shoe.

   After replacement, proceed to the following adjustments:
   - Take-up Reel-Table:
     Sec. 4-1-1. T.Reel-Table Height Adj. (including vertical play adj.)
     Sec. 5-5. Forward Torque Check
   - P.Brake Shoe
     Sec. 4-5-2. Take-up Tension Regulator Operating Position Adj.

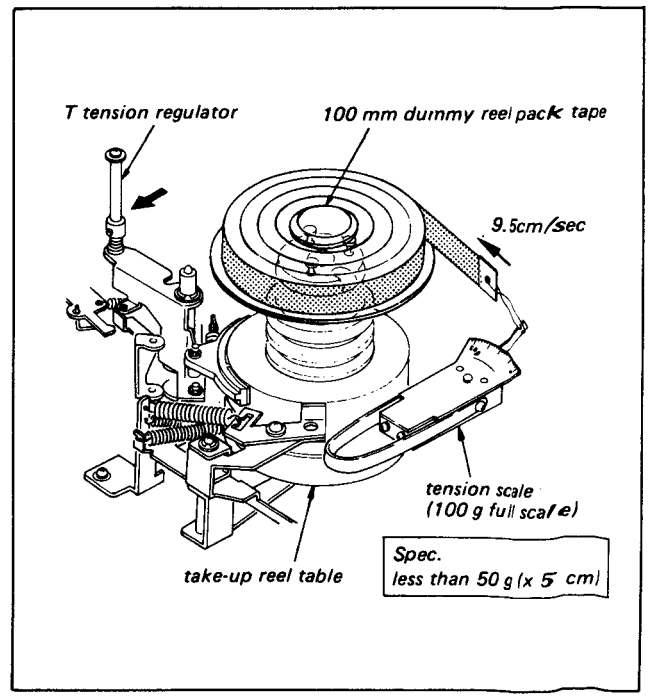


Fig. 5-6. FWD torque check (overall) (FWD mode)

5-7. REWIND TORQUE ADJUSTMENT

- If the Rewind Torque is lower than the specification, possible trouble is that tape rewinding will stop at nearly end of rewind.

1. Put the machine into the FR-STOP mode.
2. Install a 100 mm diameter dummy reel pack on the Supply Reel-Table.
3. Put the machine into the REW mode.
4. Hook a tension scale (500 g full scale) (Jig Ref. No. J-18) on an end of tape and let the tape pulled at the constant speed of approx. 9.5 cm/sec as shown in Fig. 5-7.
5. Check to see that the scale reading is 240 g ~ 350 g (x 5 cm). If not, select proper position of the craw of the FF/REW pulley. See Fig. 5-8.
   - Adjust by inserting pliers tips into hole and craw, as shown in Fig. 5-8.
   - Turning the craw ↻ clockwise increases torque. Turning the craw ↺ counter-clockwise decreases torque.
   - Each step of craw changes 30 g (x 5 cm) torque.

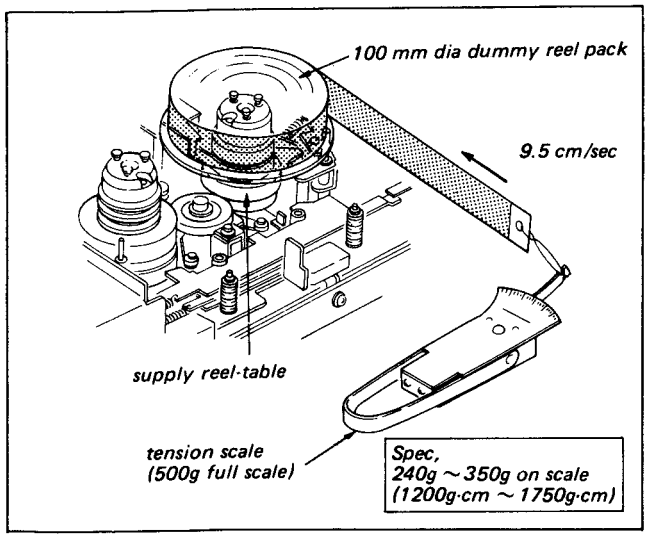


Fig. 5-7. Rewind torque adj. (REW mode)

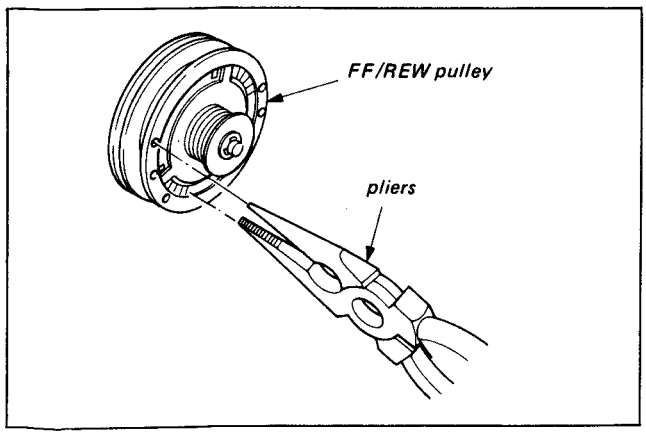


Fig. 5-8. Rewind torque adjustment

5-8. FAST-FORWARD TORQUE CHECK

1. Put the machine into the FR-STOP mode.
2. Place a 100 mm diameter dummy reel pack tape (Jig Ref. No. J-7) on the Take-up Reel Table.
3. Put the machine into the Fast Forward mode.
4. Hook a tension scale (500 g full scale) (Jig Ref. No. J-18) on an end of tape. Let the tape be pulled at the constant speed of approx. 9.5 cm/sec. See Fig. 5-9.
5. Check to see that the scale reading is higher than 300 g (x 5 cm). If not,
   (i) Clean surface of the FF/REW Idler, and that of the Take-up Reel-Table. See Fig. 5-10.
   (ii) Adjust the Rewind Torque, referring sec. 5-7.

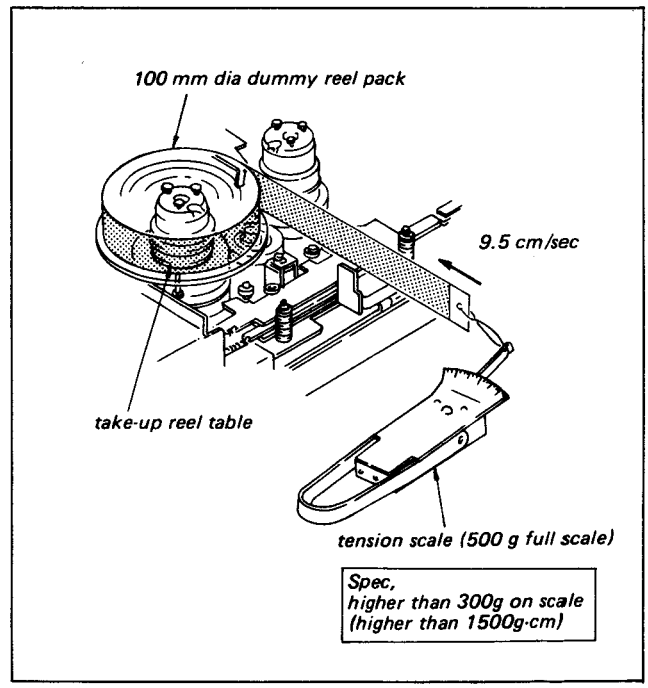


Fig. 5-9. Fast forward torque check (Fast-forward mode)

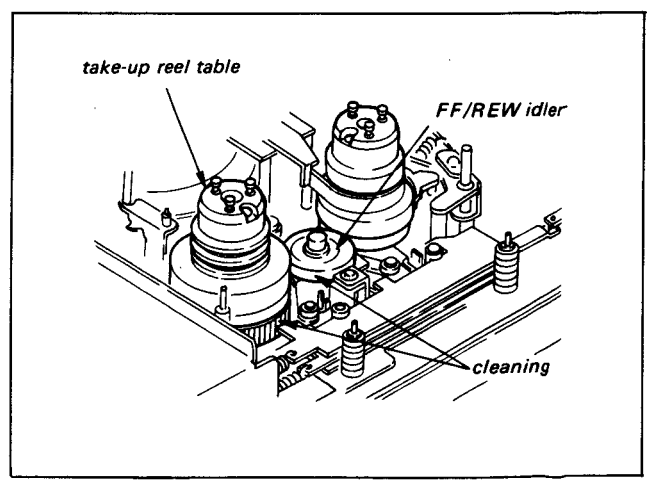


Fig. 5-10. Cleaning points

SECTION 6
TAPE RUN ALIGNMENT

6-1. PINCH ROLLER STOPPER POSITION ADJ.

- If the Pinch Roller Stopper Position is left incorrectly to have narrower gap than specification value, the Pinch Roller pressure against the Capstan will be lowered so that the possible trouble is not advanced at the rated speed.
- If, oppositely, the gap is wider than specification, the Pinch Solenoid cannot pull the iron core even though the Pinch Solenoid is energized.

1. Thread tape and put the machine into the FWD mode.
2. Check to see that the clearance Ⓑ shown in Fig. 6-1 exists between the Pinch Roller Stopper and the Pinch Lever, for 0.3 mm ~ 0.5 mm. If not, adjust the position of the Pinch Roller Stopper.
3. Repeat pressing the PAUSE button several times and confirm the clearance Ⓑ .

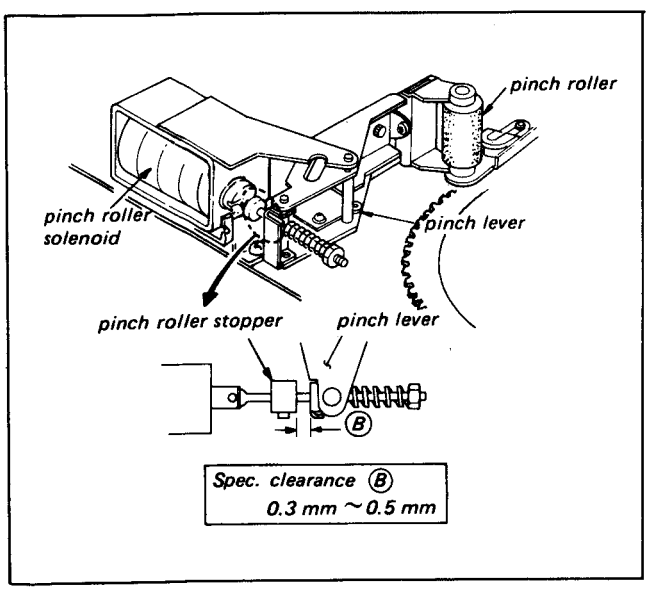


Fig. 6-1. Pinch roller stopper position adj. (FWD mode with tape)

6-2. PINCH LEVER RIGHT ANGLE ADJUSTMENT

- This adjustment is precisely factory-calibrated before shipment so that no adjustment is required in ordinary use of equipment. If this adjustment is incorrect, it is possible to cause adverse effect on the tape when the tape passes over the Capstan.

1. Put the machine into the EJECT mode, turn the POWER SW OFF.
2. Install the Pinch Lever Adjusting Jig (Jig Ref. No. J-9) as shown in Fig. 6-2, taking care not to give scar on the Capstan.
3. Hold the "A" portion of the Pinch Lever shown in Fig. 6-2 with finger and press the "A" portion until V-shaped ditch of the Pinch Lever contacts the semi-cylindrical portion of the Jig lightly. Check to see that two lamps of the Jig light simultaneously is this instance.
4. If not, loosen the two Allen type fixing screws, and adjust the Adjusting Screw so that the two lamps light at the same time.
5. After this adjustment, perform the sec. 6-6 Forward Mode Tape Run Adj.

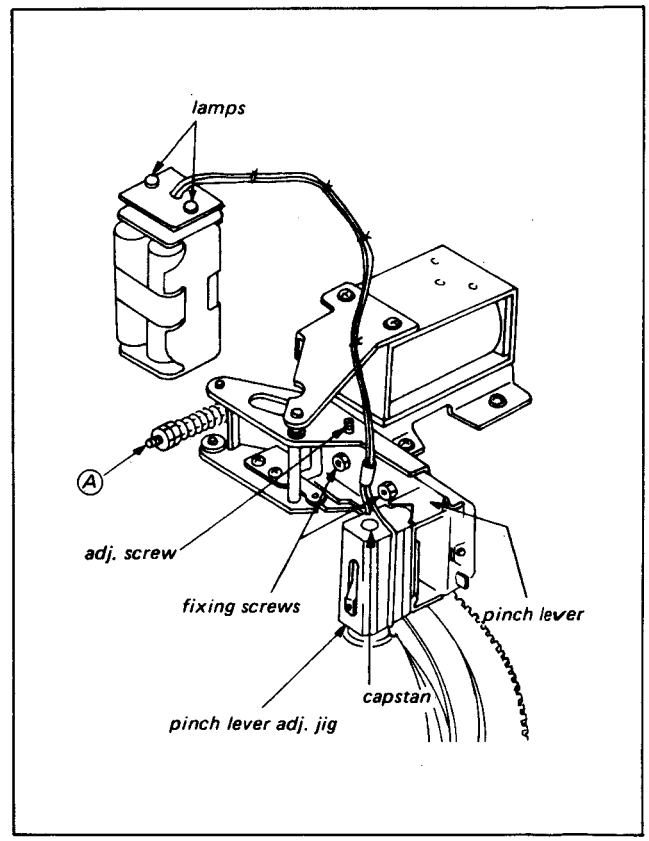
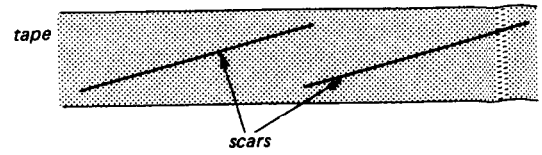


Fig. 6-2. Pinch lever right angle adj. (EJECT and power OFF mode)

6-3. PINCH ROLLER SELF-ALIGNMENT ADJUSTMENT

- If the Pinch Roller Self-Alignment is poor, Pinch Roller's position and inclination against Capstan are erroneous so that tape will get scar, in the instance of Pinch Roller's pressing against Capstan.



1. Without threading tape, put the machine into the FWD mode.
2. Confirm that the positional relationship between the pinch roller arm (A) and arm (B) meet the required specification shown in Fig. 6-3. If not, adjust as follows.

3. Put the machine into the STOP mode once.
Loosen the screws holding the sub-ring stoppers (A) and (B). Move the sub-ring stopper (A) toward Ⓒ or Ⓑ for the specification.

Move toward Ⓒ ..... Clearance ⓐ becomes larger

Move toward Ⓓ ..... Clearance ⓑ becomes larger

4. Put the machine into the FWD mode.
Confirm that the positional relationship between the pinch roller arm (A) and arm (B) meet the required spec. If the specification is satisfied, proceed with step 5. If not, perform step 3.

5. Install the sub-ring stopper (B) by pushing it slightly toward the sub-ring stopper (A).

6. Confirm the specification is satisfied when the FR-STOP is set up and then the FWD mode is set up again.

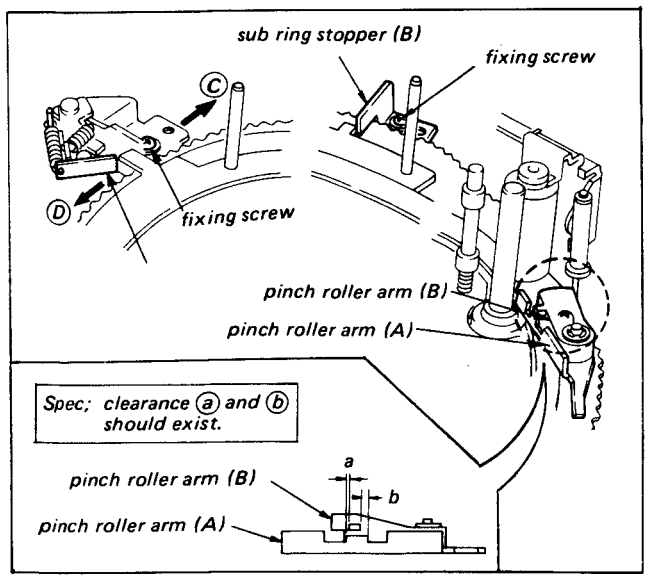


Fig. 6-3. Pinch roller self-alignment adj. (FWD mode without tape)

6-4. PINCH ROLLER SLANT ANGLE ADJUSTMENT

- If a Pinch Roller has incorrect slant angle, possible trouble is that a tape get scars diagonally across a tape. Shape of scar due to Pinch Roller of incorrect angle is a simple diagonal scars on tape or diagonal in opposite directions (shaped as / \) on tape. Another possible trouble due to incorrect slanting angle of a Pinch Roller is scars to be given in the top edge or bottom edge of the tape. These scars are resulted from curl of tape because a tape is strongly pressed against the top edge flange or bottom edge flange of the Tape Guide that locates near the Audio/CTL Head, during the period of tape threading.

- Important points of the tape damage confirmation are the following points.

  (i) Tape curl given by the Tape Guide, during the period of tape threading.

  (ii) Tape wrinkle given at around the Capstan Shaft, happening in the moment of just after the Pinch Roller pressing against the Capstan.

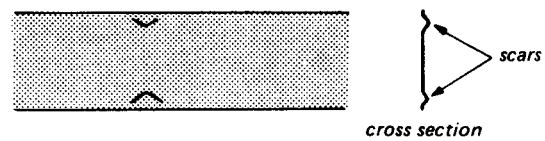
[Confirmation procedure]

(1) Tape Curl given by the Tape Guide Flange, during the period of threading.

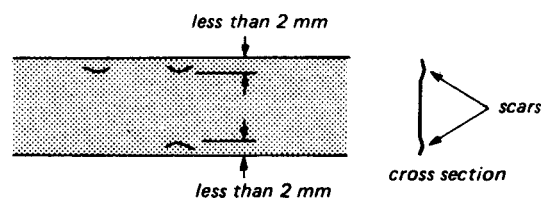
  (i) Insert a KCA-60 type cassette. Wind the tape so that approximately equal amount of tape is wound onto both of the Take-up Reel-Table and Supply Reel-Table.

  (ii) Press the FWD button to start threading and observe the tape run during threading at the Tape Guides (TG-IV, V) at both neighbours of the Audio/CTL head. Check to see that there exists no tape curl at top and bottom flanges of the Tape Guides (TG-IV, V). If there exists tape curl, it should be within the allowable limit in order to protect tape from tape curl. Allowable limit of tape curl is described in the following paragraphes.

    ① If tape curls at the flanges, and tape edge is strongly folded that results in scars, this tape curl is exceeding the allowable limit and requires adjustment.

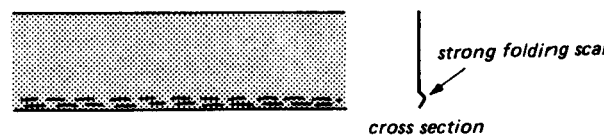


    ② Even though tape curls, the allowable limit of tape curl is described as shown. If tape curl is of small scale, not giving folding scar, the tape curl can be acceptable. (However, tape curl should not be continuous.)

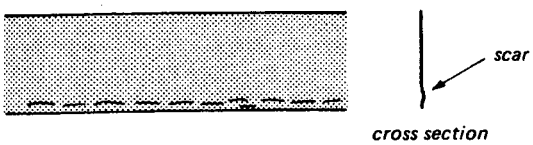


  (iii) Put the machine into STOP mode once. Press then the FWD button and observe the bottom flange of the Threading Roller so that tape is not producing curl at the bottom flange. Tape curl, if it exists, should be within the allowable limit that is described in the following paragraph.

    (1) If a strong folding scar is given on the tape edge, it is not acceptable.



(2) If a scar is negligible as shown below, though tape curls, it is acceptable. (However, length of tape scar should be less than 50 mm).



(iv) Repeat PAUSE button ON and OFF. Check to see that there is no curl due to Tape Guide Flange. If curl exists, check if it is within allowable limit indicated by step (iii).

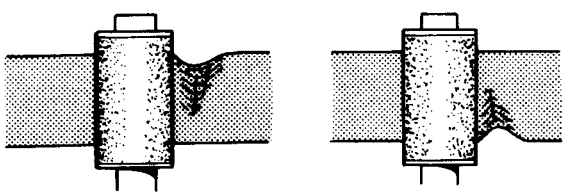
(v) Repeat tape threading and unthreading between the FR-STOP position and threading completion, for 3 or 4 times. Repeat also the PAUSE button ON and OFF 3 or 4 times. Check tape curl.

If amount of tape curl is exceeding the allowable limit, adjust in accordance with the [Adjustment Procedure] that is described later.

(2) Tape Wrinkle given at around the Capstan, happening in the moment of just after the Pinch Roller pressing against the Capstan.

(i) Insert a KCA-60 type Cassette. Wind the tape so that approximately equal amount of tape is wound onto both of the Take-up and Supply Reel-Table.

(ii) Press the FWD button to thread tape. Check to see that the tape wrinkle, that is given in the moment of the Pinch Roller's pressing against the Capstan, does disappear within two seconds. The tape wrinkle should be as shown below.



(iii) Repeat the PAUSE button ON and OFF 3 ~ 4 times and check for tape wrinkle.

If tape wrinkle exceeds the allowable limit, proceed to the [Adjustment Procedure].

[Adjustment Procedure]

- This adjustment is very critical so that it should be intiated only when the tape curl and wrinkle exceed the allowable limit. This adjustment requires very careful and deliberate work.
- Sec. 5-1 Threading Back Tension Adjustment should be completed before initiating this adjustment.
- A replacement Pinch Roller (Fig. 6-4), to be supplied from SONY Repair Parts Center, is precisely adjusted before shipment from factory such as "slanting" etc so that any extra power should never be applied to a replacement Pinch Roller: After replacement of the Pinch Roller, the tape running system works satisfactorily without any adjustment after replacement.

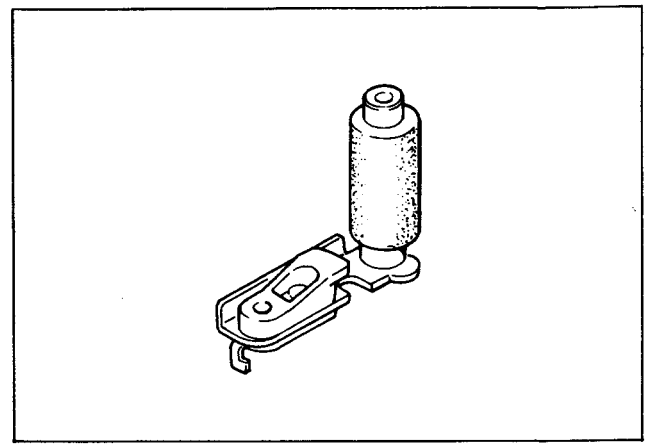


Fig. 6-4. Pinch roller unit

1. Bend the "A" portion of the Pinch Roller Arm, shown in Fig. 6-6 until requirement of (1) "Tape Curl given by the Tape Guide Flange, during the period of Threading", and (2) "Tape Wrinkle given at around the Capstan", happening in the moment of just after the Pinch Roller pressing against the Capstan.

<Criteria of Bending the Pinch Roller Arm "A" portion>

(i) Insert a Cassette. Put the machine into FWD mode and press later the PAUSE button to put machine into PAUSE mode.

(ii) Press the Pinch Lever lightly with finger in the direction shown by the arrow in Fig. 6-5 until the clearance between the Pinch Roller and the Capstan is 0.5mm.

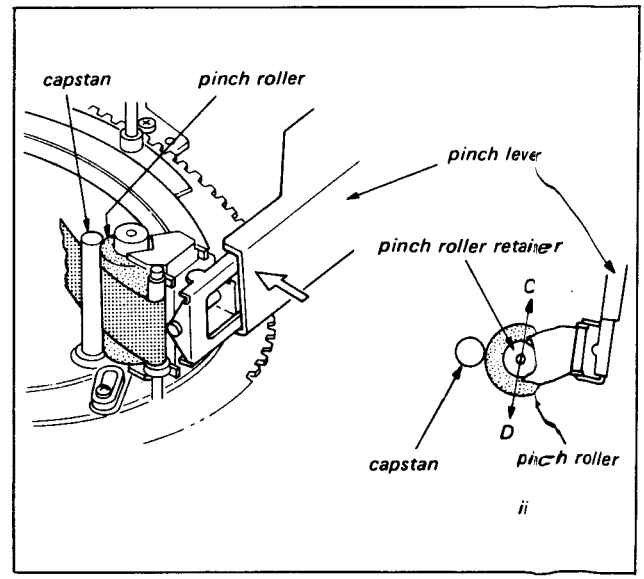


Fig. 6-5. Pinch roller slanting adj. (PAUSE mode with cassette)

(iii) Check to see that the clearances between the Capstan and the tape, at the tape top, and at the tape bottom are of equal amount, as observed by eye, visually. If they are not equal, adjust by bending the Pinch Lever's "A".

(iv) Press further the Pinch Lever in the arrow direction until the Pinch Roller is on the verge of contacting the Capstan.

(v) Check to see that the Pinch Roller Retainer shown in Fig. 6-6 does not move in the "C" direction nor in the "D" direction during the course of foregoing step (vi), as observed by eye, visually. If the Pinch Roller Retainer should move, adjust by bending the Pinch Lever's A portion.

(vi) Repeat the foregoing steps (ii) through (v) until adjustment completes. Check for no tape curl during threading and effect of the PAUSE ON/OFF.

However, the first priority of the adjustment is to remove tape curl and tape wrinkle during threading period and by PAUSE ON/OFF operation. Steps (i) through (vi) are mere criteria that are not necessarily satisfied if curl and wrinkle are removed.

(vii) If tape curl cannot be removed by any means, replace the Pinch Roller with a new unit.

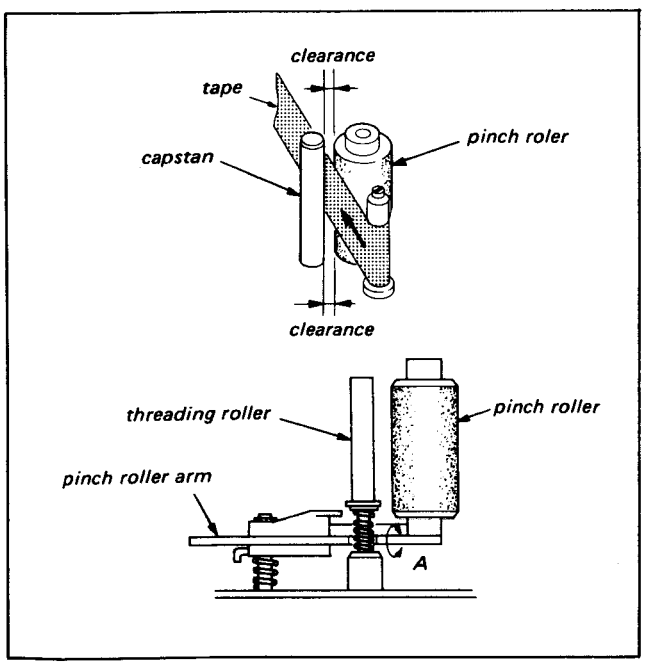


Fig. 6-6. Pinch roller slanting adj. (PAUSE mode with cassette)

6-5. FAST FORWARD AND REWIND MODES TAPE RUN ADJ.

- Purpose of this adjustment is that the tape tension at the top edge and that at the bottom edge become equal as observing the tape at around the Threading Arm, during the F.FWD mode.
- This adjustment provides a reference of the tape run in the FWD mode too, around the Threading Arm. (When tape run in the F.FWD mode is adjusted, the FWD mode tape run adjustment is also required, accordingly.)
- If this adjustment is left incorrectly, unadjusted, possible trouble is that tape gets scar during FWD, F.FWD and unthreading modes.

1. Thread a KCA-60 or KC-60 type cassette tape and put the machine into the F.FWD mode at the tape top portion.
2. Observe the surface of the running tape very carefully at each point of the Threading Arm, the Drum and the Take-up Tension Regulator, as shown in Fig. 6-8. Check to see that amount of tape tension at the two points is exactly equal i.e. equal at the tape top and tape bottom. See Fig. 6-9. If not, adjust the Screw for Adjustment at the Threading Arm shown in Fig. 6-8.

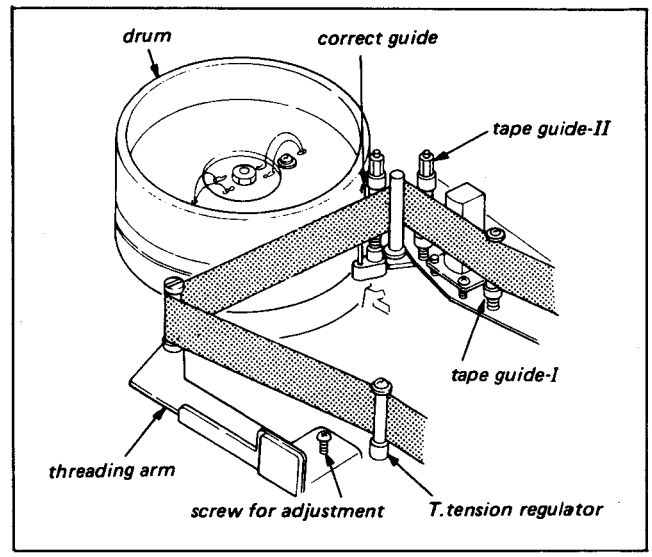


Fig. 6-8. F.FWD tape run adjustment (F.FWD mode at the tape top portion)

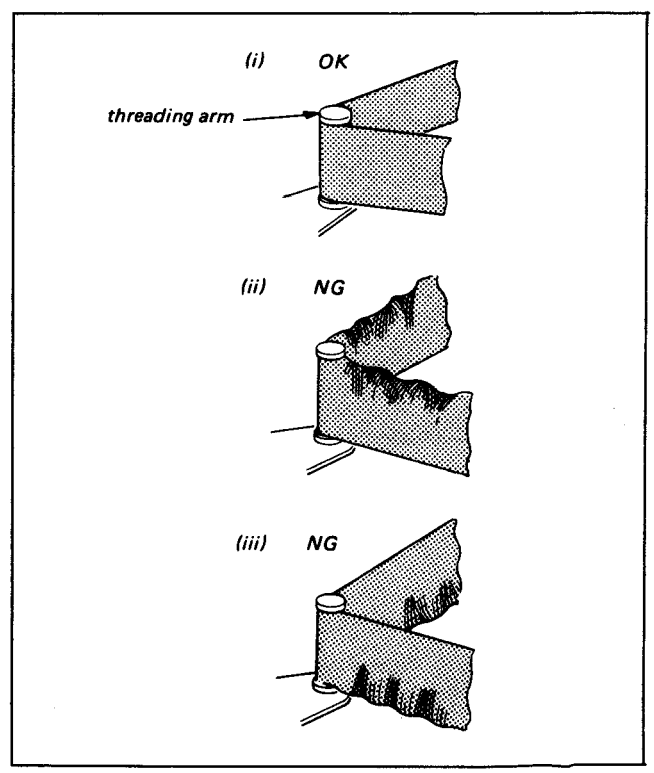


Fig. 6-9. F.FWD tape run adj. (F.FWD mode at the tape top portion)

- If a tape curl is observed at the Flange of the Threading Arm, adjust height of the Threading Arm by re-setting the position of the Arm Adjustment Spacer, shown in Fig. 6-10.

  Stop the machine. Loosen the Fixing Screw shown in Fig. 6-10. Adjust vertical position of the Spacer for Arm Adjustment, shown in Fig. 6-10.

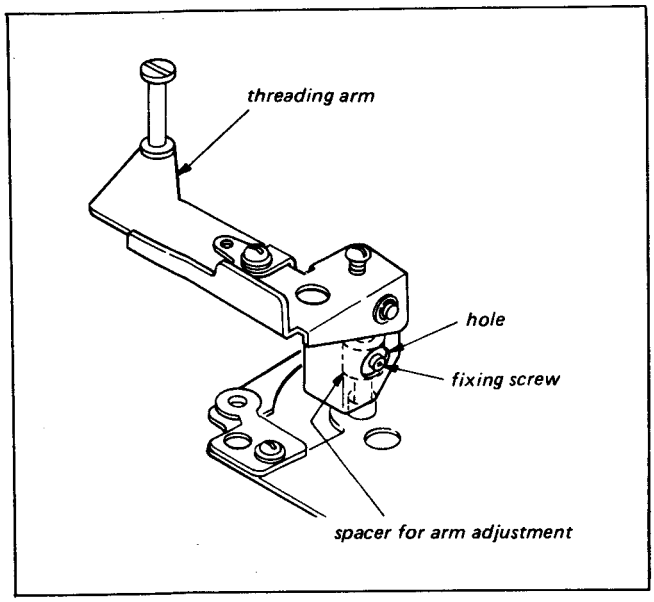


Fig. 6-10. F.FWD tape run adjustment (FR-STOP mode)

3. Put the machine into the REW mode.
4. Observe the running tape at the Tape Guide II at the Tape Guide III, shown in Fig. 6-11. Check to see tape runs without curl at Tape Guide II and Tape Guide III. If tape curls, bend bottom of correct guide shown in Fig. 6-11 with pliers.

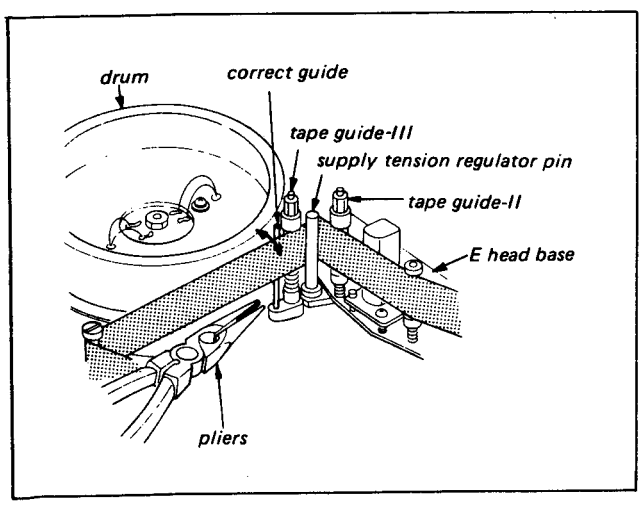


Fig. 6-11. Rewind tape run adj. (REW mode with tape)

5. Put the machine into the Forward mode. Check to see that the top of the correct guide pin does not contact the tape and drum. If it does, re-adjust the step 4.

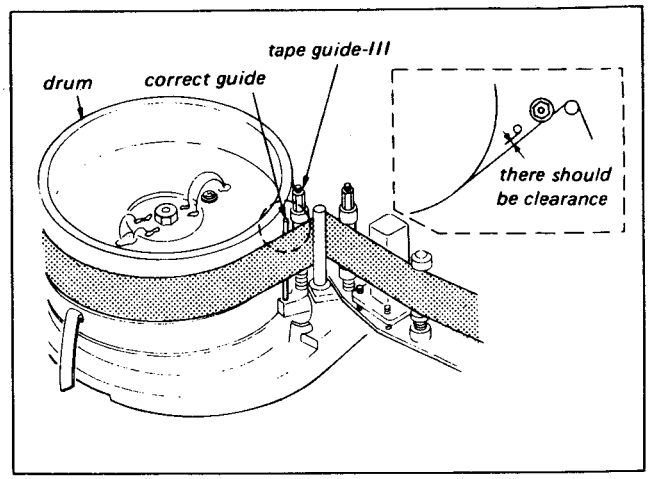


Fig. 6-12. Rewind tape run adj. (FWD mode with tape)

6-6. FORWARD MODE TAPE RUN ADJUSTMENT

- Purpose of this adjustment is that tape runs without curl to be caused by the Guide Flange, during threading and also that tape has equal tape tension at the top edge and bottom edge as observing at the Threading Arm while tape is running in the FWD mode.
- This FWD mode tape tun adjustment is required when the F.FWD mode tape run adjustment is attempted.
- If a machine is left with incorrect FWD mode Tape Run, with increased Take-up reel-table's take-up torque, advancing tape in FWD mode can give scar on tape.

1. Thread a KCA-60 or KC-60 type cassette tape and put the machine into the FWD mode at the tape top portion.
2. Observe the surface of the running tape shown in Fig. 6-13 very carefully at three points of the Upper Sub-ring Guide, the Threading Arm and the Take-up Tension Regulator. Check to see amount of tape tension is exactly equal at tape top and tape bottom.

   If not, slightly loosen the fixing screw shown in Fig. 6-13, and adjust gently the Slantness Adj. Plate using an eccentric screwdriver (Jig Ref. No. J-5).
   After adjustment, tighten the fixing screw.

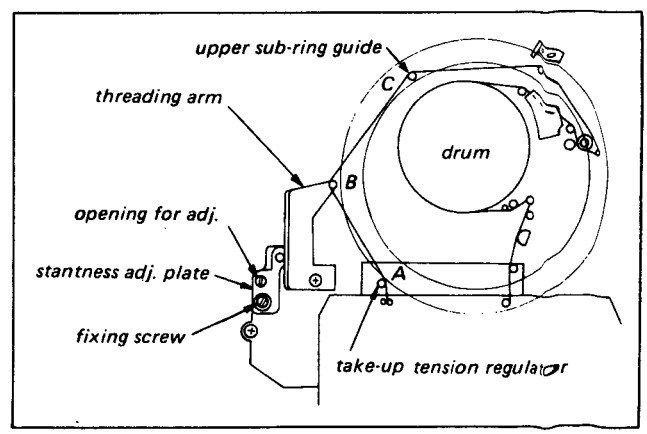


Fig. 6-13. FWD mode tape run adj. (FWD mode with tape)

3. While in the Forward mode, observe the bottom of the tape, at the Threading Roller so that tape runs in contact with the flange of the Threading Roller without curl.

   If bottom of the tape is "not in contact" or is making "curl" at the flange of the Threading Roller, adjust the height of the Threading Roller as follows.

   i) Observe the clearance or curl between the bottom of the tape and the flange of the Threading Roller.

   ii) Press the STOP button and let the Pinch Roller unthread. Turn the POWER SWITCH OFF in the moment when the Pinch Roller comes in front of the Audio Head.

   iii) Loosen the fixing screw in the bottom of the Threading Roller, shown in Fig. 6-14 and adjust the Threading Roller Shaft for correct hightness in observing step (i). Tighten the fixing screw.

   iv) Turn the POWER SWITCH ON. Put the machine into the Forward mode and check again the clearance or curl. If not, adjust the step (iii).

4. Press the STOP button to put the machine once into the FR-STOP mode, and press the FWD button to observe the tape motion during the threading.

5. While threading the tape, check to see that the Tape Guide IV and V, shown in Fig. 6-14 are not causing any scar on tape.

6. After finishing this adjustment, proceed to the Sec. 6-4 Pinch Roller Slant Angle adjustment.

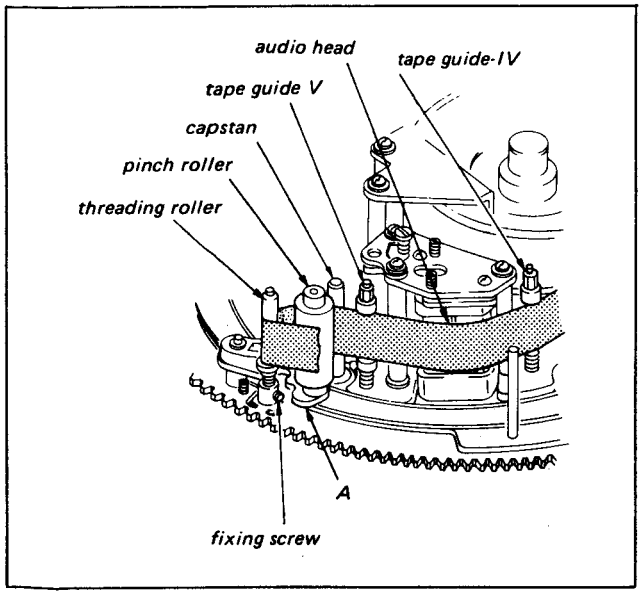


Fig. 6-14. FWD mode tape run adj. (FWD mode with tape)

6-7. TAPE ADVANCING POWER ADJUSTMENT

- If a machine has a lower tape advancing power than the required value, possible trouble is that the normal tape speed cannot be obtained in FWD mode. If an attempt is made to have too much higher Tape Advancing Power, mechanical load to the Capstan becomes excees load to cause adverse effect on the Capstan.

- Creak sound are heard from the capstan shaft section in the FWD when the advancing power is low. If the creak sound become remarkable, the tape running stops, trace scratches are made on the tape or sometimes the tape is cut. Check the possible causes of the creaks in such cases.

1. Without inserting tape, put the machine into the FWD mode.

2. Check to see that clearance (A) as shown in Fig. 6-15.

   If (A) clearance will not exist, proceed to the sec. 6-1.

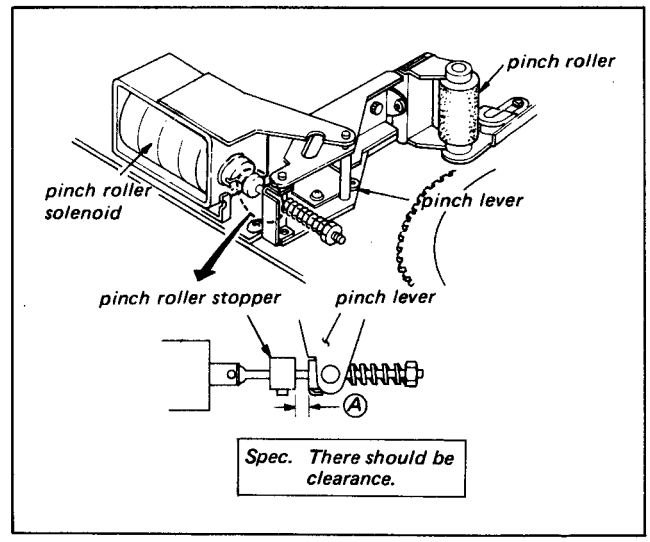


Fig. 6-15. Tape advancing power adj. (FWD mode without tape)

3. Prepare a Locally-Specially-Made-Tape referring Fig. 6-17. Hook a 1000 g full scale tension scale on an end of the specially-made-tape. Face the magnetic coating side toward the Capstan. While grasping the tension scale so as not to be pulled into the Capstan, insert the another end of the specially-made between the Pinch Roller and the Capstan and let the tape be pulled by the Capstan.

4. Pull the tension scale against the tape advancing power, gradually, until tape starts its slippage at the Capstan, Take the tension scale reading, that should be in between 700 g ~ 1100 g. If not, adjust the nut shown in Fig. 6-15.

5. After completion of adjustment, re-check the foregoing step 2.

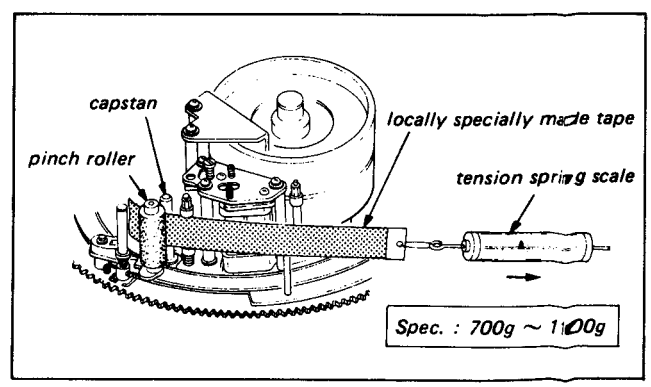


Fig. 6-16. Tape advancing power adjustment (FWD mode without tape)

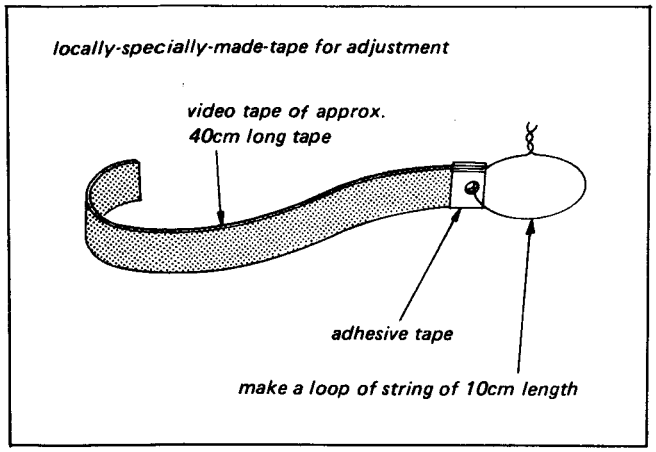
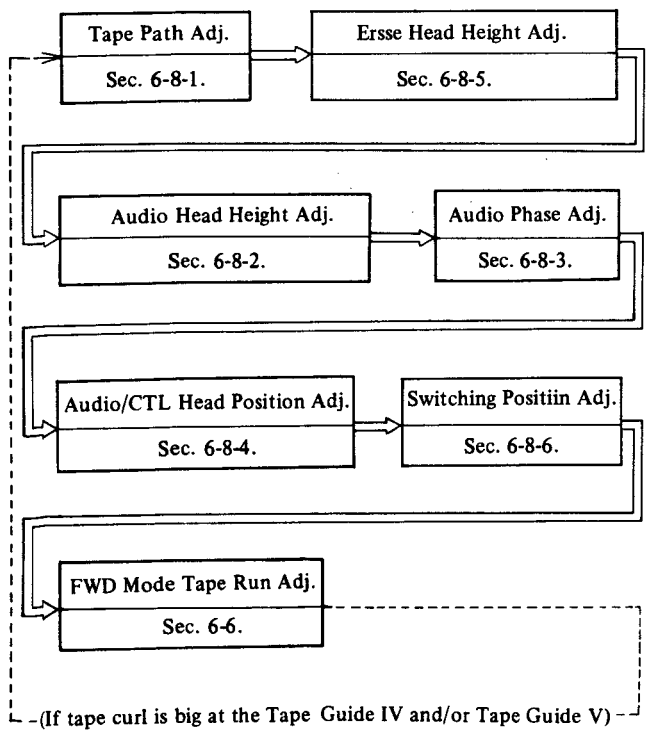

locally-specially-made-tape for adjustment
video tape of approx.
40cm long tape
adhesive tape
make a loop of string of 10cm length

Fig. 6-17

- Disassemble a cassette. Cut a tape into 40cm long. Attach an adhesive tape to an end of the tape as shown in Fig. 6-17. Make a hole on the adhesive tape. Make a loop of 10cm long string through the hole. It is convenient in adjustment as any mark is written on the magnetic coating side of the tape, when cutting tape into 40cm long.

6-8. TRACKING ADJUSTMENT

The Tracking Adjustment is required to be performed in this sequence.



6-8-1. Tape Path Adj.

- This Tape Path Adjustment determines the tape interchangeability. Very deliverate adjustment and care are required throughout the course of Tape Path Adjustment.

1. Connect scope to RP-2 board TP-15 externally triggered from TP-13. Set the SYSTEM SELECT SW to PAL/SECAM mode.
2. Playback the type RR5-1 PAL Alignment tape (Jig. Ref. No. J-21) monoscope signal portion.
3. As observing the waveform on scope, turn the TRACKING Control knob in both directions and check to see that amplitude of the RF waveform on scope increases/decreases with its envelope remains flat.

   If waveform envelope does not remain flat when the TRACKING Control is manipulated, adjust the Tape Guide II, the Tape Guide III, the Tape Guide IV, the Tape Guide V and the Supply Tension Regulator referring Fig. 6-20. However, do not adjust the S.Tension Regulator, as much as possible.
4. Adjust the TRACKING Control for the maximum RF output signal amplitude.
5. Check that the RF signal envelope fluctuation of amplitude is within the specifications. If outside the specifications, adjust by means of step 3.

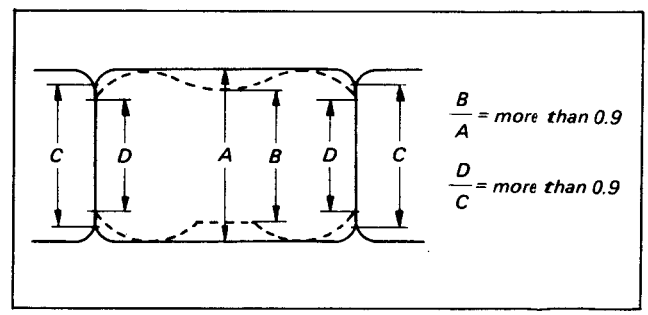


Fig. 6-18. Tape run adjustment (fluctuation of amplitude) (FWD mode, playing back RR5-1 PAL)

6. Adjust the TRACKING Control for the maximum RF output.
7. Check that the RF envelope is within the specifications of Fig. 6-19.

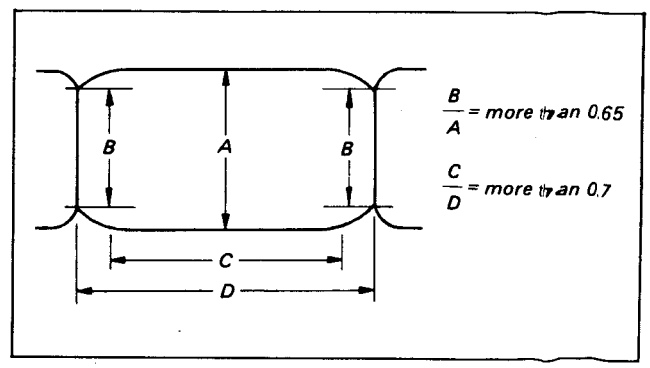


Fig. 6-19. Tape run adjustment (tape-to-head contact) (FWD mode, playing back RR5-1 PAL)

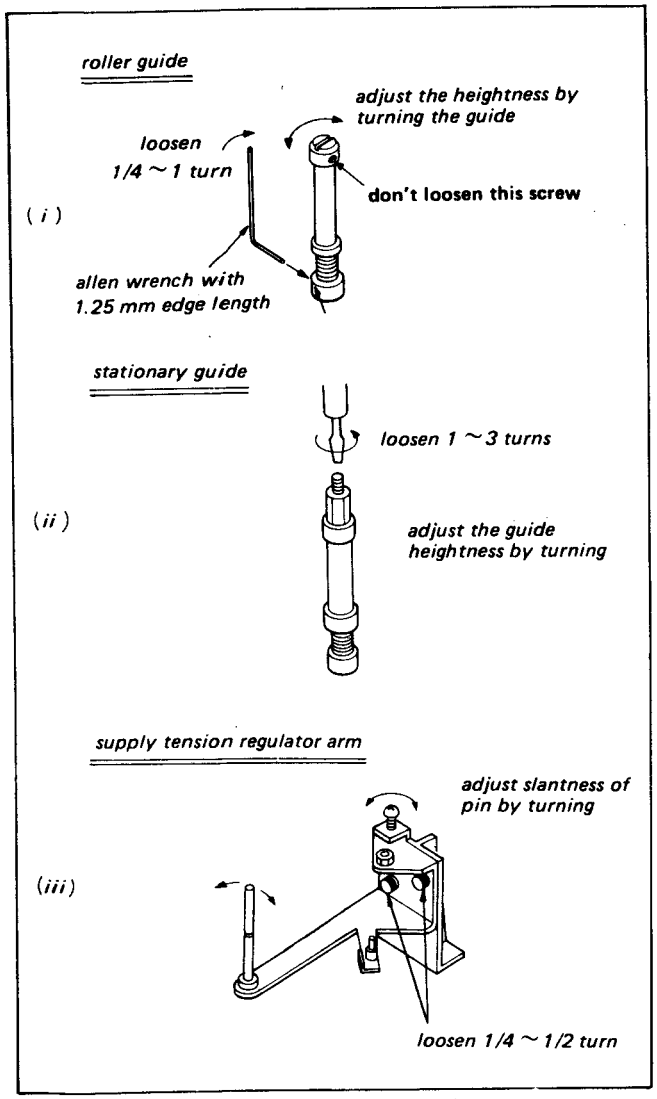

roller guide
adjust the heightness by turning the guide
loosen 1/4 ~ 1 turn
don't loosen this screw
(i)
allen wrench with 1.25 mm edge length
stationary guide
loosen 1 ~ 3 turns
(ii)
adjust the guide heightness by turning
supply tension regulator arm
adjust slantness of pin by turning
(iii)
loosen 1/4 ~ 1/2 turn

Fig. 6-20. Adjustment of tape guides

6-8-2. Audio Head Height Adj.

- If a machine has an incorrect Audio Head Height, the audio signal-to-noise ratio will be deteriorated when playing back a tape that is pre-recorded by any other recorder.

1. Connect the AC VTVM to the LINE OUT CH-1 connector. Set the SYSTEM SELECT SW to PAL/SECAM mode.
2. Playback the Alignment tape RR5-1 PAL (Jig Ref. No. J-21) 1kHz portion.
3. While playing back, observe the audio output level increase as the tape is lightly pressed down at Ⓐ portion as shown in Fig. 6-21. The level increase should not be more than 0.5 dB.

   If level increase is more than 0.5 dB when pressing down at Ⓐ, loosen the Locking Screw (A) and turn both Height Adj. Screws very small increment in (↶) counter-clockwise until the level increase is within 0.5 dB increase. Tighten the Locking Screw.

   Connect the AC VTVM to the CH-2 output. While playing back, observe the audio output level increase as the tape is lightly pushed up at the Ⓑ portion in Fig. 6-21. The level increase should not be more than 0.5 dB.

   If level increase is more than 0.5 dB when pushing up at Ⓑ, loosen the Locking Screw (A) and turn both Height Adj-Screws by small increment in (↷) clockwise until the level increase is with 0.5 dB. Tighten the Locking Screw.

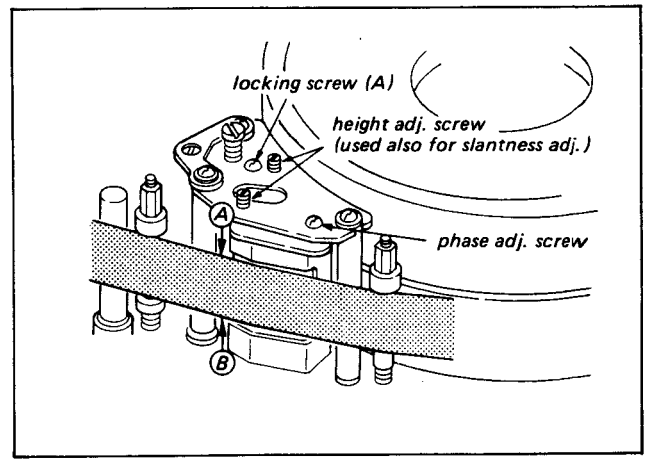


Fig. 6-21. Audio head height adj. (FWD mode, playing back RR5-1 PAL)

6-8-3. Audio Azimuth/Phase Adj.

Prior to this Audio Phase Adjustment, sec. 6-8-2 Audio Head Height Adj. should have been finished already.

1. Connect the AC VTVM to the LINE OUT CH-1 connector. Set the SYSTEM SELECT SW to PAL/SECAM mode. Playback the 10kHz segment of Alignment Tape RR5-1 PAL (Jig Ref. No. J-21)
2. Loosen the locking screw (A). Adjust the phase adj. screw for maximum level and fighten the screw.
3. Playback the 1kHz segment of the Alignment tape RR5-1 PAL.
4. Connect CH-1/CH-2 LINE OUT connector to the horizontal and vertical inputs of the oscilloscope respectively so that a Lissajous figure appears on the scope. Adjust the scope for horizontal and vertical amplitudes of 6 cm. See Fig. 6-22.
5. Check that the vertical amplitude at the center in the horizontal direction is within 0.7 cm. See Fig. 6-22.

   If it is not correct, loosen the head Locking Screw, shown in Fig. 6-22 and adjust the Phase Adjusting Screw for the correct value.

   After the adjustment, re-tighten the head Locking Screw. Check the Lissajous figure after tightening the screw because sometimes tightening causes phase shift. If it is outside the specification, repeat the adjustment.
6. Playback the Alignment tape 10 kHz segment.
7. Check to see that the Lissajous waveshape is within 90 deg.

TAPE RUN

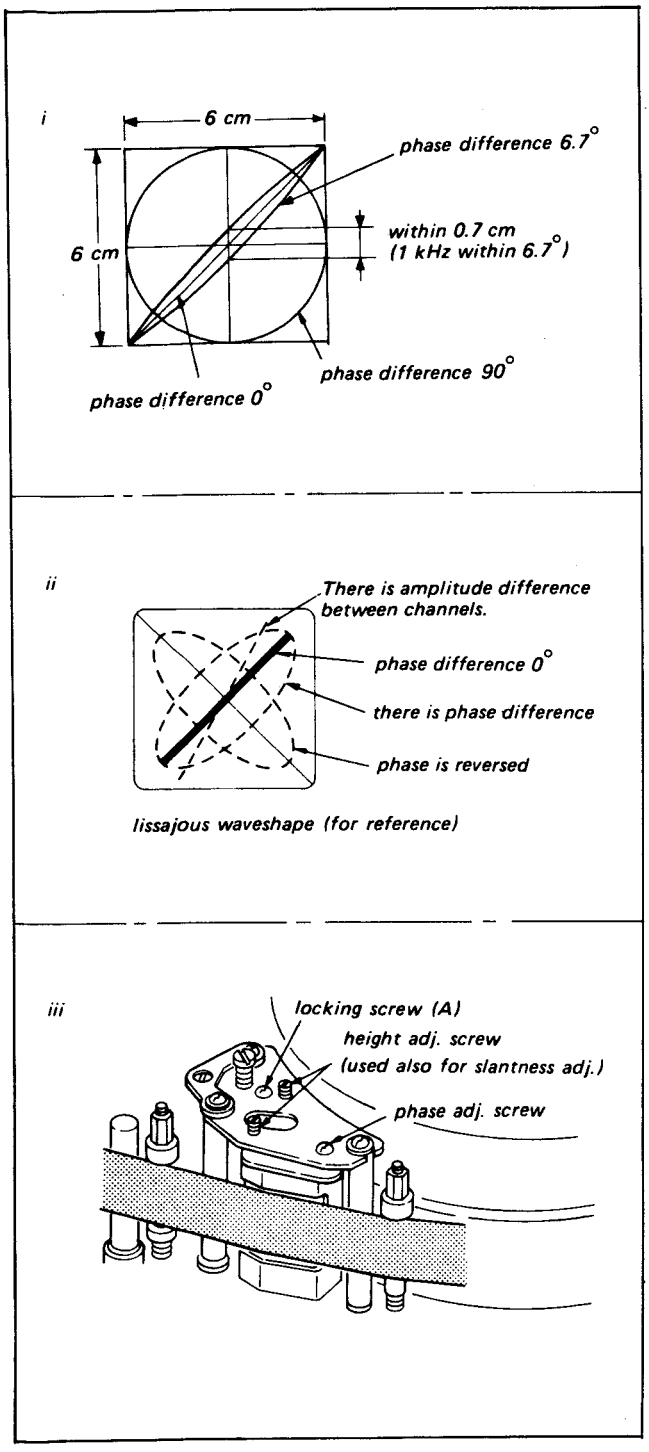


Fig. 6-22. Audio head phase adjustment (FWD mode, playing back RR5-1 PAL)

6-8-4. Audio/CTL Head Position Adj.

- If the AUDIO/CTL Head position is located other than the specified position, pre-recorded tape interchangeability among multiple machines will have trouble.
- When either the Upper drum (with video heads), Head Drum Assembly or Audio/CTL Head is replaced, this adjustment is required to be executed.
- Prior to this adjustment, the following adjustments should have been completed earlier.

  sec. 6-8-1. Tape Path Adj.
  sec. 6-8-2. Audio Head Height Adj.
  sec. 6-8-3. Audio Head Phase Adj.

1. Connect scope; CH-1 to the RP-2 board TP-15 externally triggered from TP-13, ⊕ polarity, 2ms/sec of horiz. time base.
   Set the SYSTEM SELECT SW to PAL/SECAM mode.
2. Set the TRACKING Control to its center (detemt) position.
3. Playback the RR5-1 PAL Alignment tape (Jig Ref. No. J-21) monoscope portion.
4. Check to see that the TP-15 waveform has the maximum amplitude when the TRACKING Control is set in the mechanical center (detent) position.

   If not, loosen the three locking screws and adjust the AUDIO/CTL Head position very small increment, using an eccentric screwdriver (Jig Ref. No. J-6) in the arrow direction.
5. Tighten the Locking Screw after adjustment.

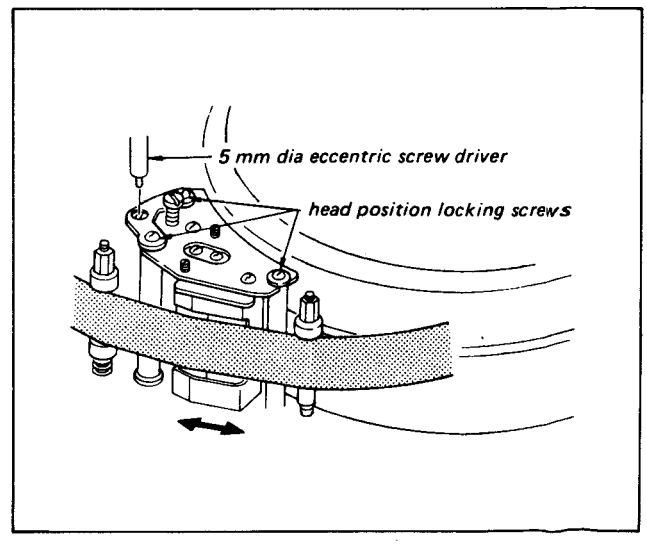


Fig. 6-23. Audio/CTL head position adj. (FWD mode, playing back RR5-1 PAL)

6-8-5. CTL PB Head Height Adjustment

1. Playback the Alignment tape (RR5-1) (Jig Ref. No. J-23) and confirm the relative position between the video tape's top edge and CTL PB Head's top edge.

2. The CTL PB Head should extrudes above the video tape top edge by 0.1mm ~ 0.3mm. If not, loosen the securing screw (L) and adjust the head height by turning the three height adjusting screws (A), (B) and (C) of exactly equal amount of tunring, and in the same direction. Tighten the securing screw (L) and check the height again.

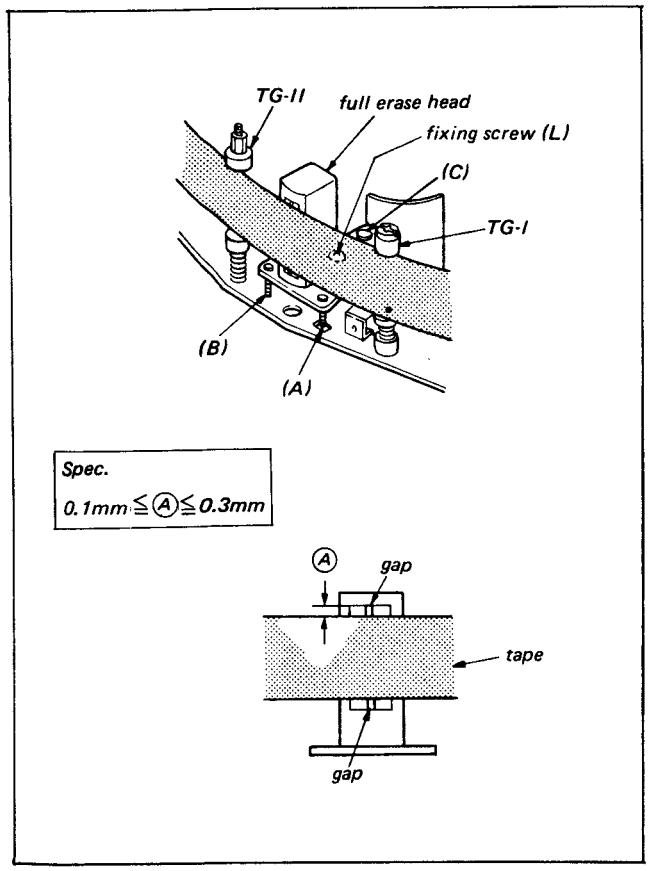


Fig. 6-24. CTL PB head height adj. (PLAY mode, playing back RR5-1)

- If the CTL PB Head is lower than top edge of the video tape, turn the height adjusting screws (A), (B) and (C) in clockwise direction.

3. After adjustment is completed, tighten the securing screw (L) and check height again by step 1.

6-8-6. Switching Position Adjustment

(Check Procedure)

1. Connect the dual trace oscilloscope to TP-1/SV-10 board and VIDEO OUT connector, with trigger from TP-1/SV-10 board.
   Set the SYSTEM SELECT SW to PAL/SECAM mode.

2. Play back the alignment tape (RR5-1 PAL) and set the TRACKING Control to its center (detent) position.
   And confirm that the specification is satisfied.
   If not, perform Step 4 for the adjustment.

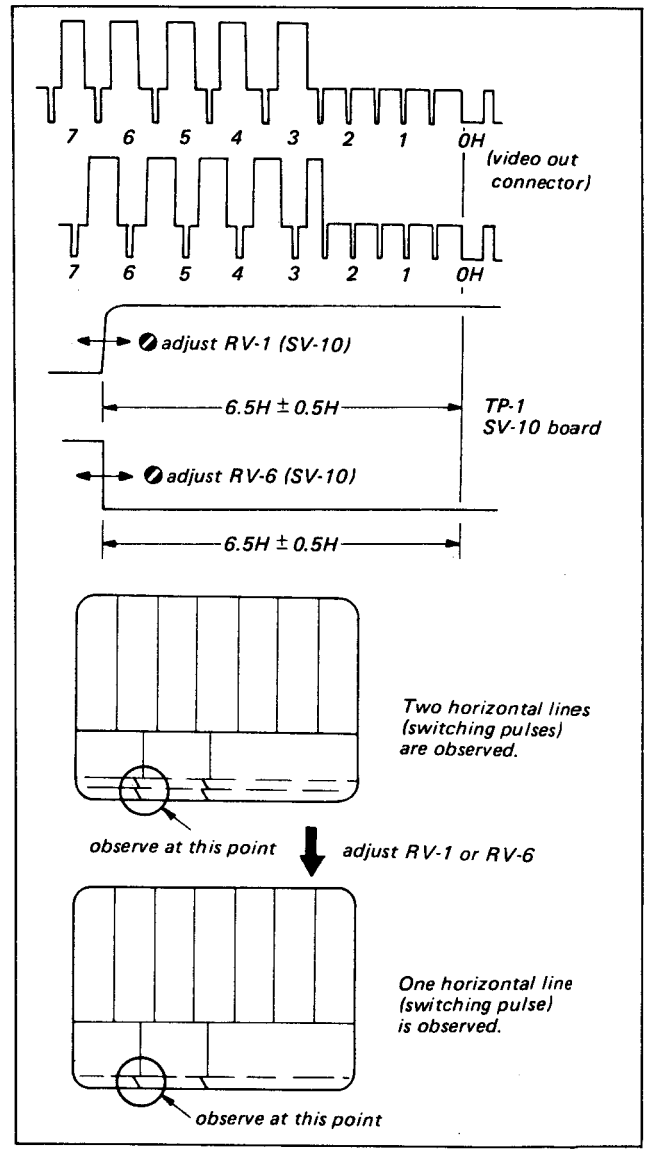

7 6 5 4 3 2 1 0H
(video out connector)
7 6 5 4 3 2 1 0H
adjust RV-1 (SV-10)
6.5H ± 0.5H
TP-1
SV-10 board
adjust RV-6 (SV-10)
6.5H ± 0.5H
Two horizontal lines (switching pulses) are observed.
observe at this point
adjust RV-1 or RV-6
One horizontal line (switching pulse) is observed.
observe at this point

Fig. 6-25. Switching position adj. (PLAY mode, playing back RR5-1 PAL)

3. Observe the monitor picture and confirm that the sw tiching pulse shown in Fig. 6-25 are not two but only one observed at the lower section of the picture.

   (The switching position adjustment is sufficient if the specification is satisfied in Step 2 but if adjustment is necessary perform Step 5.)

(Adjustment Procedure)

4. Adjust RV-1 and RV-6 on the SV-10 board shown in Fig. 6-25 for the specification.

5. Adjust RV-1 or RV-6 so that the switching position of the CH-A is identical with that of the CH-B.

6-9. UNTHREAD SLACK SWITCH POSITION ADJ.

- This machine has three tape slack detecting devices. The first is the take-up reel rotation detecting device installed on the tape counter relay pulley that is detecting tape slack in the FWD (detection of the take-up reel table rotation). The second is the supply reel rotation detecting section installed beneath the supply reel table that is detecting tape slack in the REV (detection of supply reel table rotation). The third is the unthread-slack-switch that is to detect the tape tension in the unthreading.
- The errorneous position of this switch allows that the threading ring starts unthreading even when the take-up reel happens to become defective and has no ability to wind the tape onto take-up reel table. The tape can be damaged as it is left inside mechanism.

1. Insert the cassette and set up the FWD mode.
2. Push the actuator of the unthread slack switch with the finger in the direction indicated by the arrow in Fig. 6-28 until the switch is turned off. Confirm the turning-OFF by a click sound of the microswitch.
3. Return the actuator gradually from that position and stop it when the microswitch is turned ON.
4. Release the actuator from the finger at this position of step 3. Confirm that the moving distance of the actuator from the step 3 point to the point where it touches the tape to be stopped is within the specification shown in Fig. 6-28. If the specification is not satisfied, adjust the position of the unthread slack switch.

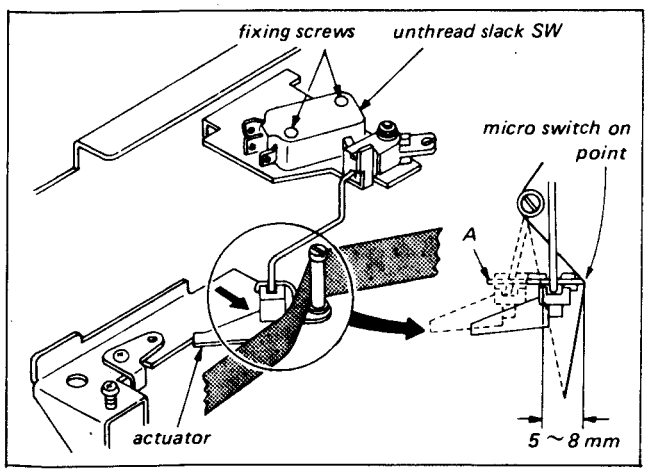


Fig. 6-28. Unthread slack switch adjustment (FWD mode with tape)

5. Place the machine into the EJECT mode.
6. Push the actuator of the unthread slack switch in the opposite direction against the arrow so as to turn ON the switch and return it gradually until the switch is turned off. Confirm that the clearance between the white plastic plate at the root of the actuator and the metal plate is more than 0.5mm.
   If it is not, adjust again the switch position so that this clearance specification and the specification in Step 4 are satisfied.

6-10. VIDEO HEAD DIHEDRAL ADJUSTMENT

- This adjustment is normally unnecessary, but is required only when an Upper Drum is replaced. (Replacement Upper Drum is precision-adjusted by micro-scope before shipment from factory.)

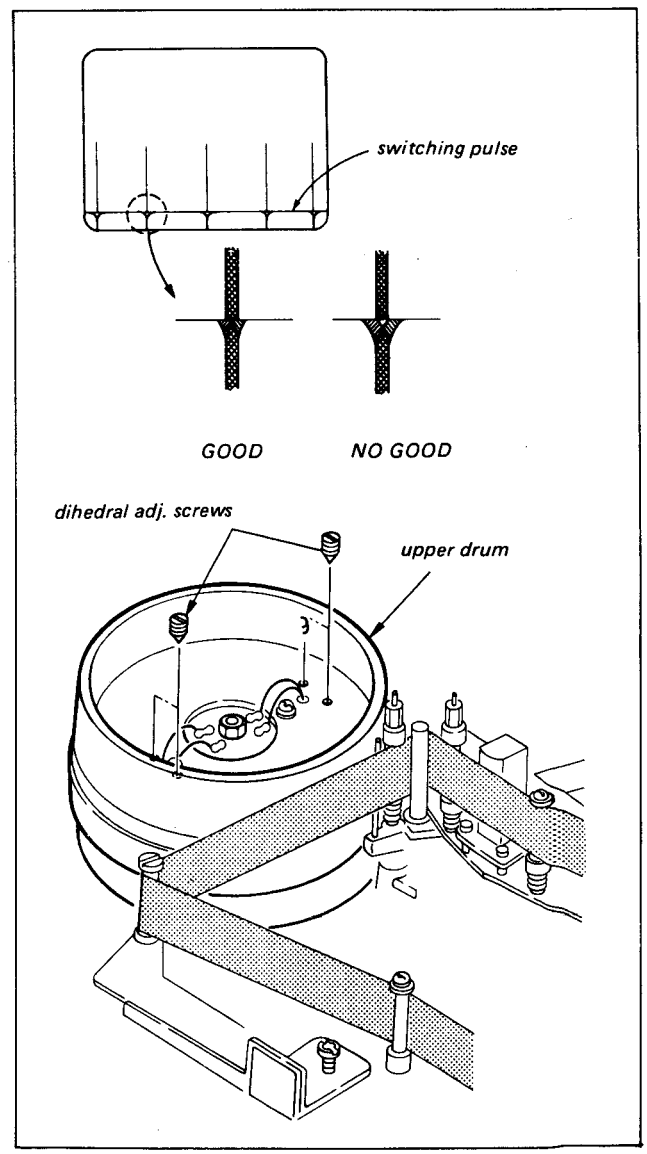


Fig. 6-29. Video head dihedral adj. (alignment tape RR5-1 PAL playback mode)

1. Playback the Monoscope signal portion of the Alignment tape (RR5-1 PAL). Check to see that one vertical line beneath the switching point on the monitor screen looks divided into two separated lines which should normally be one line. (If one vertical line looks as two separate lines, dihedral adjustment is necessary. When one line is not divided into two lines, adjustment is not necessary.)
2. Put the machine into FR-STOP mode. Mount four pieces of Dihedral Adjusting Screws (Jig Ref. No. J-10) into the Upper Drum threaded holes. Turn the four Adjusting screws lightly.

3. Turn either one of the two Dihedral Adj. Screw that locates the video head with WHITE lead. Turn it further until some stiff feeling is felt. If this screw is turned further-more, Dihedral Adjustment is made, by moving the Video Head. So, turn this screw an additional quarter turn.

4. Playback the Alignment Tape (RR5-1 PAL) with four screws installed on the Upper Drum. Check for dihedral distortion. If got worse, turn this screw counter-clockwise and turn then the neighbouring Dihedral Adj. Screw. Advance this screw a quater turn step, and check playback after each screwing. Adjust until dihedral error is removed.

5. When adjustment is complete, remove the Dihedral Adj. screws. After removal, playback tape and check dihedral again. (Dihedral error re-appears sometimes after screws are removed.)

Note: When Dihedral Adj. screws are repeatedly tightened and loosened, the single screw that screws the Video Head piece can be loose.

6-11. TAPE SPEED ADJUSTMENT

1. Power line frequency must be measured as reference data for the adjustment. Write down the measured value.

Reference: The allowable power line frequency for this machine is either 50 or 60 Hz ±0.5%.
60 Hz: 16.58 to 16.75 msec.
50 Hz: 19.90 to 20.10 msec.
} Measured on an electronic counter-timer.

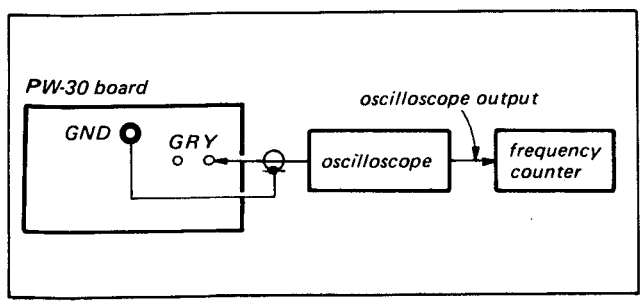


Fig. 6-30. Connections for power line frequency measurement

2. Play back the audio 3 kHz segment of the alignment tape.

3. Connect the scope to TP-102 on the AP-1 board and connect the frequency counter to the vertical output of the scope.

4. **Specification:** Differs depending upon the power line frequency and speed calibration values printed on the alignment tape label. Table 6-1 shows the tape speed specification along with the power line frequency at 0% calibration values.
Calculate the mid-value of the tape speed specification using the speed calibration value printed on the alignment tape label.

Example: calibration value: −0.1%
power line frequency: 16.63 msec (60 Hz + 0.2%)

$$3{,}006 \times \left(1 - \frac{-0.1}{100}\right) = 3{,}009$$

(−0.1 ← calibration value; 3,006 ← from Table 6-1)

∴Tape Speed Spec. = $3{,}009\ ^{+3}_{-9}$ Hz

5. **Adjustment:** If the speed is outside the specification, adjust as outlined below.
(1) Clean the Capstan Belt and apply oil to the capstan bearing.
(2) If it is still outside the specification, replace the capstan belt with a new one.
(3) If the specified value is not obtained after Steps (1) and (2), replace the motor pulley as shown in Fig. 6-31. Kinds of pulleys and variations in tape speed due to the pulley replacement are shown in Table 6-2.
Select a suitable pulley by considering the measured value of the tape speed and the mark on the pulley on the unit.
(4) Confirm that the tape speed is within the specified value following replacement.

Line Frequency			Tape Speed Specification (TP-102/AP-1)
	For 60 Hz	For 50 Hz	
	16.58 msec	19.90 msec	$3015\ ^{+3}_{-9}$ Hz
	16.60 msec	19.92 msec	$3012\ ^{+3}_{-9}$ Hz
	16.62 msec	19.94 msec	$3009\ ^{+3}_{-9}$ Hz
	16.63 msec	19.96 msec	$3006\ ^{+3}_{-9}$ Hz
	16.65 msec	19.98 msec	$3003\ ^{+3}_{-9}$ Hz
Center	16.67 msec	20.00 msec	$3000\ ^{+3}_{-9}$ Hz
	16.68 msec	20.02 msec	$2997\ ^{+3}_{-9}$ Hz
	16.70 msec	20.04 msec	$2994\ ^{+3}_{-9}$ Hz
	16.72 msec	20.06 msec	$2992\ ^{+3}_{-9}$ Hz
	16.73 msec	20.08 msec	$2988\ ^{+3}_{-9}$ Hz
	16.75 msec	20.10 msec	$2985\ ^{+3}_{-9}$ Hz

Table 6-1. Tape speed specification (TP-102/AP-1)

60 Hz Pulley		50 Hz Pulley	
Parts Code No.	Tape Speed variation (TP102/AP-1)	Parts Code No.	Tape Speed variation (TP102/AP-1)
3-655-431-01	4.34 Hz	3-655-433-01	4.55 Hz
3-655-431-11	4.34 Hz	3-655-433-11	4.55 Hz
3-655-431-21	4.34 Hz	3-655-433-21	4.55 Hz
3-655-431-31	4.34 Hz	3-655-433-31	4.55 Hz
3-655-431-41	4.34 Hz	3-655-433-41	4.55 Hz
3-655-431-51	4.34 Hz	3-655-433-51	4.55 Hz
3-655-431-61	4.34 Hz	3-655-433-61	4.55 Hz
3-655-431-71	4.34 Hz	3-655-433-71	4.55 Hz
3-655-431-81	4.34 Hz	3-655-433-81	
3-655-431-91			

Frequency at TP-102 (AP-1) increases. ↓

Table 6-2. Motor pulleys and tape speed variation

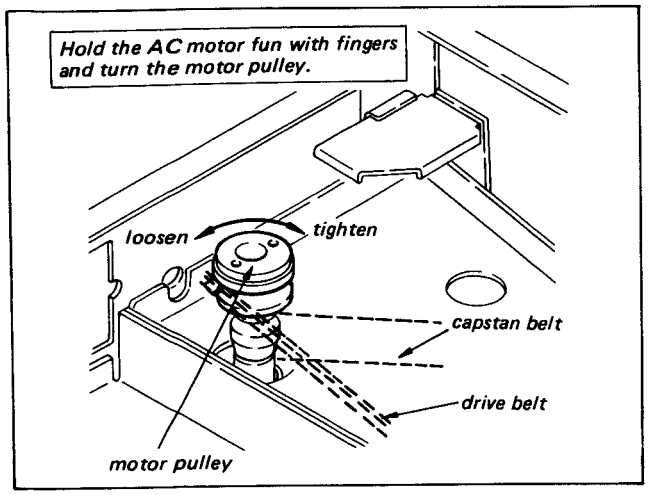


Fig. 6-31. Replacement of motor pulley

SECTION 7
POWER SUPPLY ALIGNMENT

[Equipment Required]

DC Voltmeter

7-1. REG 12V ADJUSTMENT

machine condition for adjustment	spec.		adjustment
Playback mode	*TP-2/PW-30*	*12.0V ±0.2V DC*	*R16/PW-30 board*

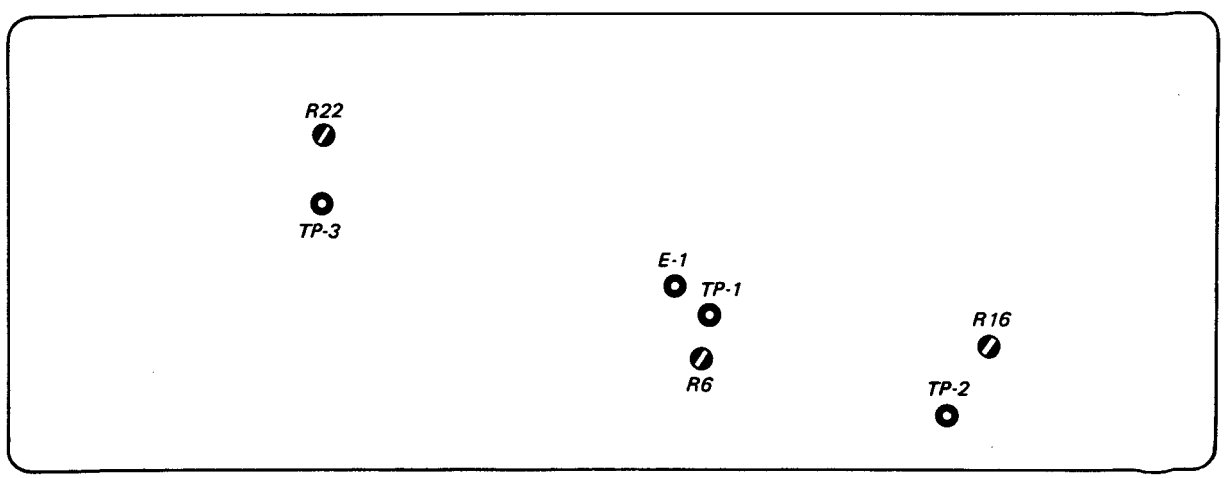
Note: If the REG 12V adjustment is attempted, re-alignment of the video system and servo system are required. Do not attempt adjustment to the REG 12V power supply unless machine performance is obviously poor due to incorrect power supply voltage. If adjustments are made to the power supply, re-alignment of the video and servo systems is neseccsay.

7-2. REG 24V ADJUSTMENT

machine condition for adjustment	spec.		adjustment
Playback mode	*TP-1/PW-30*	*24.0 ±0.2V DC*	*R6/PW-30 board*

7-2. REG 6.8V ADJUSTMENT

machine condition for adjustment	spec.		adjustment
Playback mode	*TP-3/PW-30*	*6.8V ±0.1V DC*	*R22/PW-30 board*



PW-30 board

SECTION 8
SERVO SYSTEM ALIGNMENT

[Equipment Required]

Alignment Tape; RR5-1S PAL (SONY Parts No. 8-960-015-61)
RR4-7S SECAM (SONY Parts No. 8-960-014-87)
RR5-1S NTSC (SONY Parts No. 8-960-015-01)

Contents of RR5-1S PAL and RR5-1S NTSC

Tape Counter	Video Track	Audio Track
000 – 137	Monoscope	3kHz, 0dB
137 – 249	Colour bar (75%)	3kHz, 0dB
249 – 346	RF sweep	3kHz, 0dB
346 – 390	No signal	1kHz, 0dB
390 – 432	No signal	10kHz, –10dB

Contents of RR4-7S SECAM

Tape Counter	Video Track	Audio Track
000 – 346	Colour bar (75%)	No signal

Blank Tape; KCA-60 or KCS-20 (SONY standard products)
Oscilloscope, dual trace

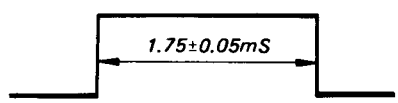
[Mechanical Parts Cleaning]

Clean the tape running system and drive system, refferring Section 2.

8-1. TAPE SPEED ADJUSTMENT

Refer to the Section 6-11.

8-2. V BLANKING PULSE WIDTH ADJUSTMENT

machine conditions for adjustment	spec.	adjustment
• *SYSTEM SELECT SW; PAL/SECAM* • *Playback mode; RR5-1S PAL or RR4-7S SECAM*	*TP-2/SV-10* 	*RV2/SV-10 board*

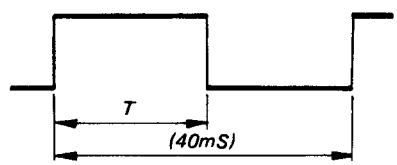
8-3. DRUM FREE SPEED ADJUSTMENT (PAL/SECAM)

machine conditions for adjustment	spec.	adjustment
• *SYSTEM SELECT SW; PAL/SECAM* • *Playback mode; RR5-1S PAL or RR4-7S SECAM*	*TP-18/SV-10* *6.3 ±0.1 V DC*	*RV5/SV-10 board*

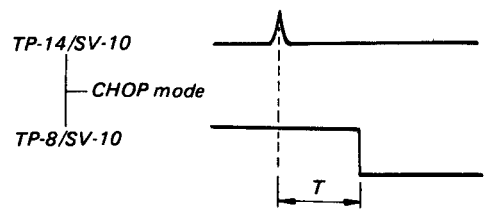
8-4. DRUM FREE SPEED ADJUSTMENT (NTSC)

machine conditions for adjustment	spec.	adjustment
• *SYSTEM SELECT SW; NTSC* • *Playback mode; RR5-1S NTSC*	*TP-18/SV-10* *7.0 ±0.1 V DC*	*RV4/SV-10 board*

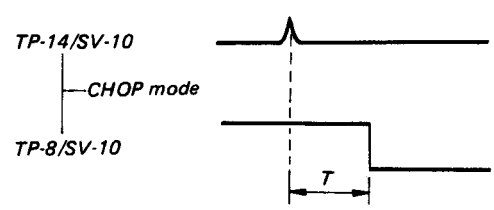
8-5. TRACKING CONTROL VARIABLE RANGE CALIBLATION

machine conditions for adjustment	spec.	adjustment
• *SYSTEM SELECT SW; PAL/SECAM* • *TRACKING CONTROL; detent position* • *Playback mode; RR5-1S PAL or RR4-7S SECAM*	*TP-7/SV-10*  *T = 19.5±0.5mS*	*RV9/SV-10 board*

8-6. TRACKING CONTROL CALIBLATION (PAL/SECAM)

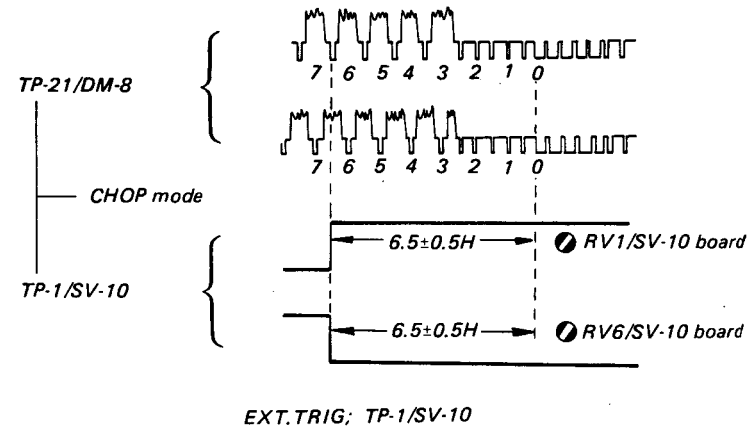
machine conditions for adjustment	spec.	adjustment
• *SYSTEM SELECT SW; PAL/SECAM* • *TRACKING CONTROL; detent position* • *Playback mode; RR5-1S PAL or RR4-7S SECAM*	 *T = 1.5±0.5mS*	*RV7/SV-10 board* *EXT. TRIG; TP-1/SV-10*

8-7. TRACKING CONTROL CALIBLATION (NTSC)

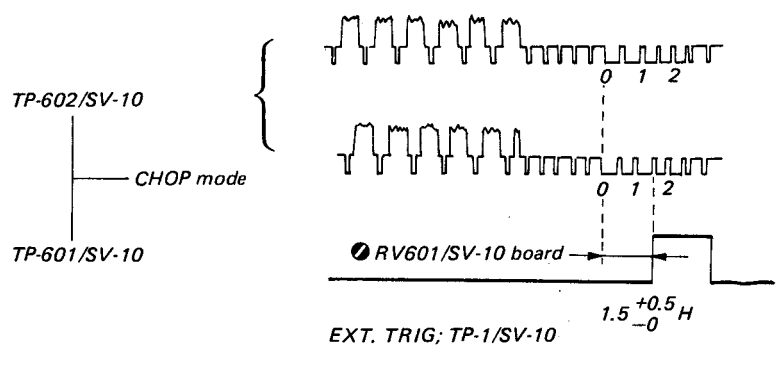
machine conditions for adjustment	spec.	adjustment
• *SYSTEM SELECT SW; NTSC* • *TRACKING CONTROL; detent position* • *Playback mode; RR5-1S NTSC*	 *T = 1.5±0.5mS*	*RV8/SV-10 board* *EXT. TRIG; TP-1/SV-10*

SERVO

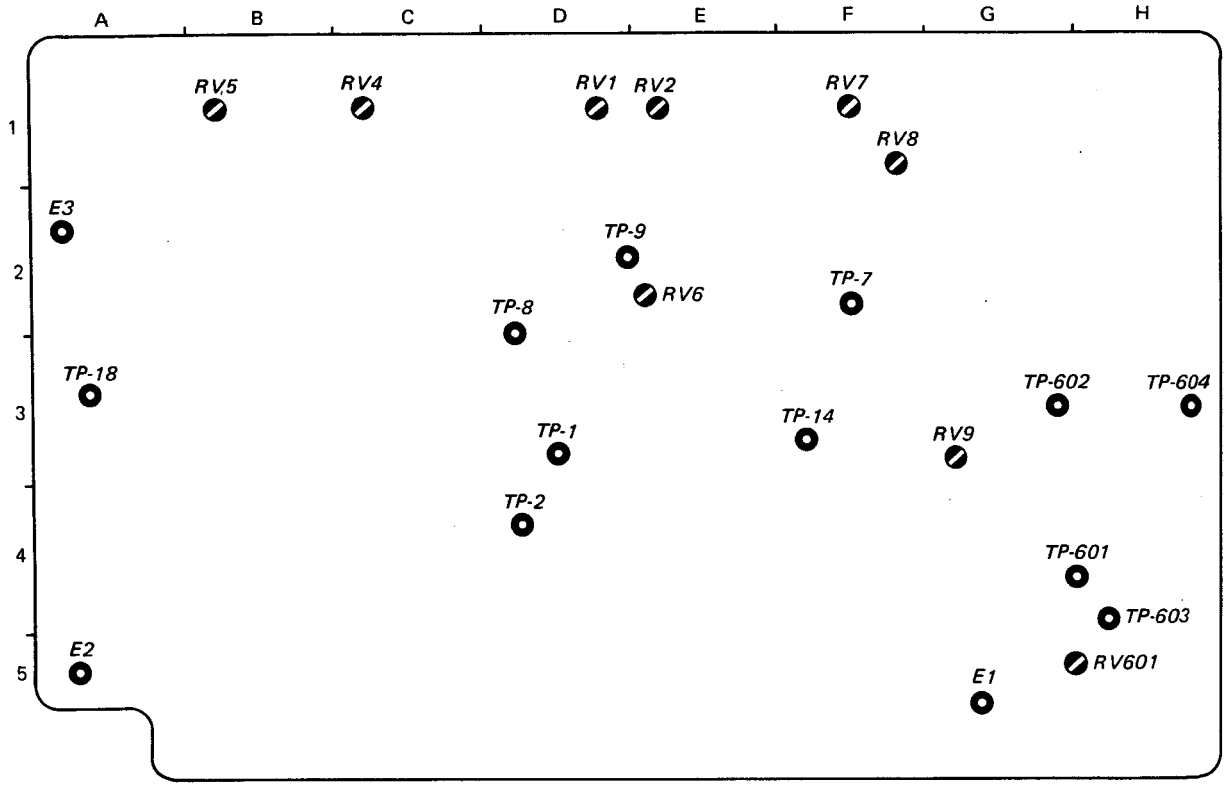
8-8. SWITCHING POSITION ADJUSTMENT

machine conditions for adjustment	spec. & adjustment
• *SYSTEM SELECT SW; PAL/SECAM* • *Playback mode; RR5-1S PAL or RR4-7S SECAM*	

8-9. STILL VD POSITION ADJUSTMENT

machine conditions for adjustment	spec. & adjustment
• *SYSTEM SELECT SW: PAL/SECAM* • *Short TP-603 ⟷ TP-604 /SV-10 with jumper* • *Playback mode: RR5-1S PAL or RR4-7S SECAM*	

SERVO


A
B
C
D
E
F
G
H
1
2
3
4
5
RV5
RV4
RV1
RV2
RV7
RV8
E3
TP-9
RV6
TP-7
TP-8
TP-18
TP-602
TP-604
TP-14
TP-1
RV9
TP-2
TP-601
TP-603
E2
RV601
E1

SV-10A board

SECTION 9
AUDIO SYSTEM ALIGNMENT

[Equipment Required]

Alignment Tape; RR5-1S PAL (SONY Parts No. 8-960-015-61)

Contents of RR5-1S PAL

Tape Counter	Video Track	Audio Track
000 – 137	Monoscope	3kHz, 0dB
137 – 249	Colour bar (75%)	3kHz, 0dB
249 – 346	RF sweep	3kHz, 0dB
346 – 390	No signal	1kHz, 0dB
390 – 432	No signal	10kHz, –10dB

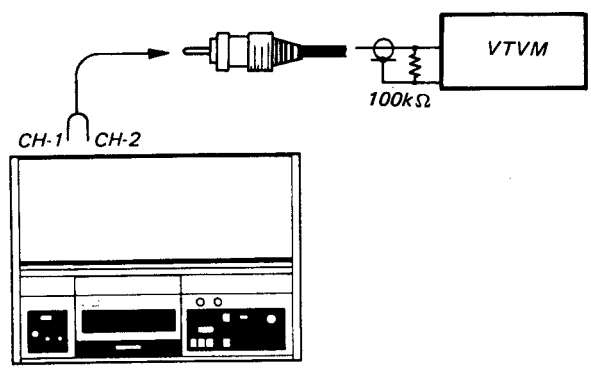
VTVM

[Cleaning]

Clean the head, durm, and tape paths such as tape guides with a chamois dampened with methanol.

[Head degaussing]

Demagnetize the heads with the head demagnetizer.



9-1. AUDIO HEAD HEIGHT ADJUSTMENT

Refer to the Section 6-8-2.

9-2. AUDIO AZIMUTH/PHASE ADJUSTMENT

Refer to the Section 6-8-3.

9-3. AUDIO/CTL HEAD POSITION ADJUSTMENT

Refer to the Section 6-8-4.

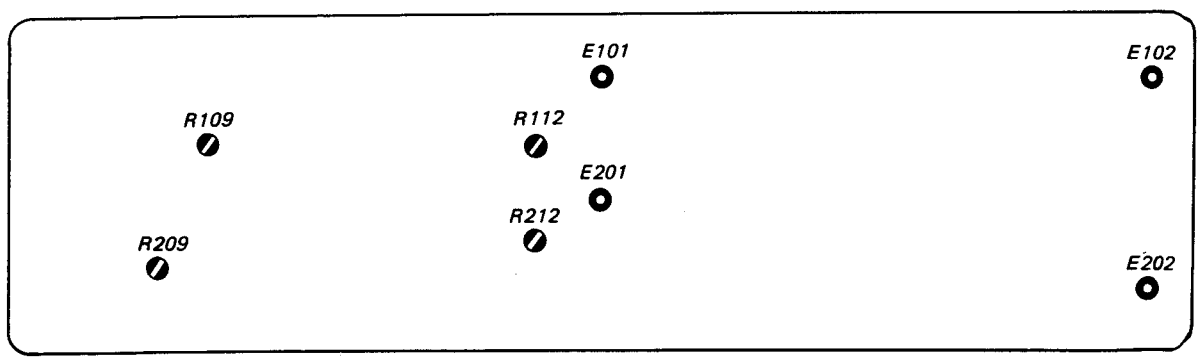
9-4. PLAYBACK LEVEL ADJUSTMENT

machine conditions for adjustment	spec.	adjustment
• *SYSTEM SELECT SW; PAL/SECAM* • *Playback mode; RR5-1S PAL (1kHz segment)*	*LINE OUT (terminated)* *−5±0.5dB*	*R112/AP-1 (CH-1/L)* *R212/AP-1 (CH-2/R)*

9-5. PLAYBACK FREQUENCY RESPONSE ADJUSTMENT

machine conditions for adjustment	spec.	adjustment
• *SYSTEM SELECT SW: PAL/SECAM* • *Playback mode; RR5-1S PAL (1kHz/10kHz segment)*	*LINE OUT (terminated)* *[10kHz PB Level] = [1kHz PB Level] −10±1.5 dB* *NOTE; Alignment tape 10kHz is recorded at −10dB level.*	*R109/AP-1 (CH-1/L)* *R209/AP-1 (CH-2/R)*

Repeat sec. 9-4 PB Level and sec. 9-5 PB Freq. Resp. adj. alternatingly.



AP-1A board

SECTION 10
VIDEO SYSTEM ALIGNMENT

[Equipment Required]

Alignment Tape; RR5-1S PAL (SONY Parts No.8-960-015-61)
RR4-7S SECAM (SONY Parts No. 8-960-014-87)

Contents of RR5-1S PAL and RR5-1S NTSC

Tape Counter	Video Track	Audio Track
000 – 137	Monoscope	3kHz, 0dB
137 – 249	Colour bar (75%)	3kHz, 0dB
249 – 346	RF sweep	3kHz, 0dB
346 – 390	No signal	1kHz, 0dB
390 – 432	No signal	10kHz, –10dB

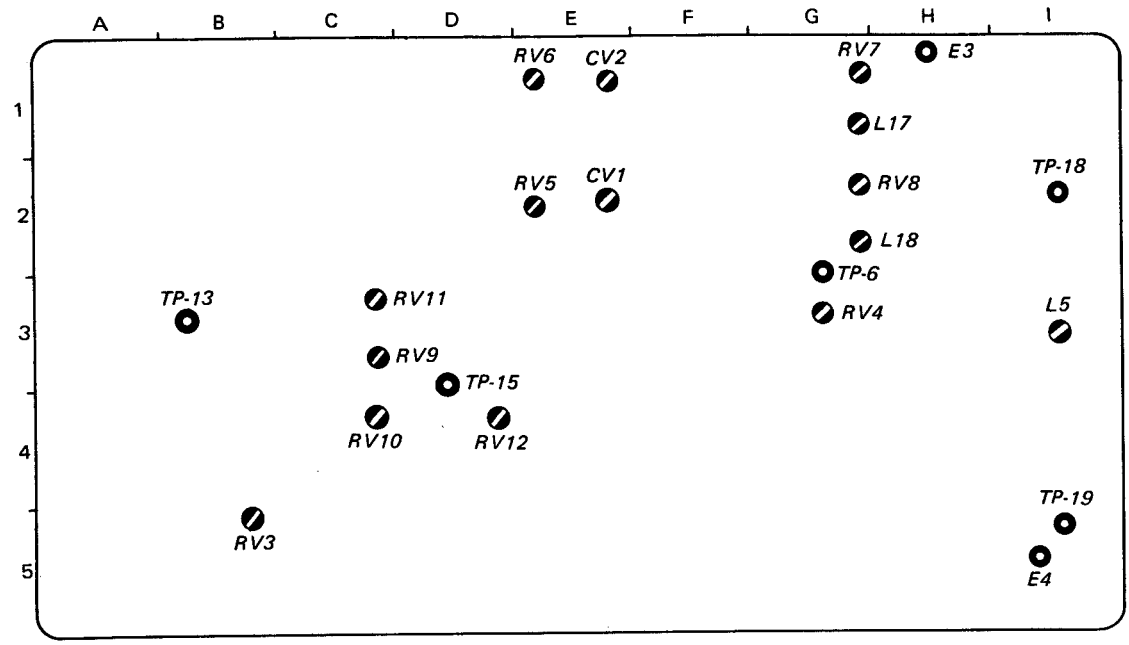
Contents of RR4-7S SECAM

Tape Counter	Video Track	Audio Track
000 – 346	Colour bar (75%)	No signal

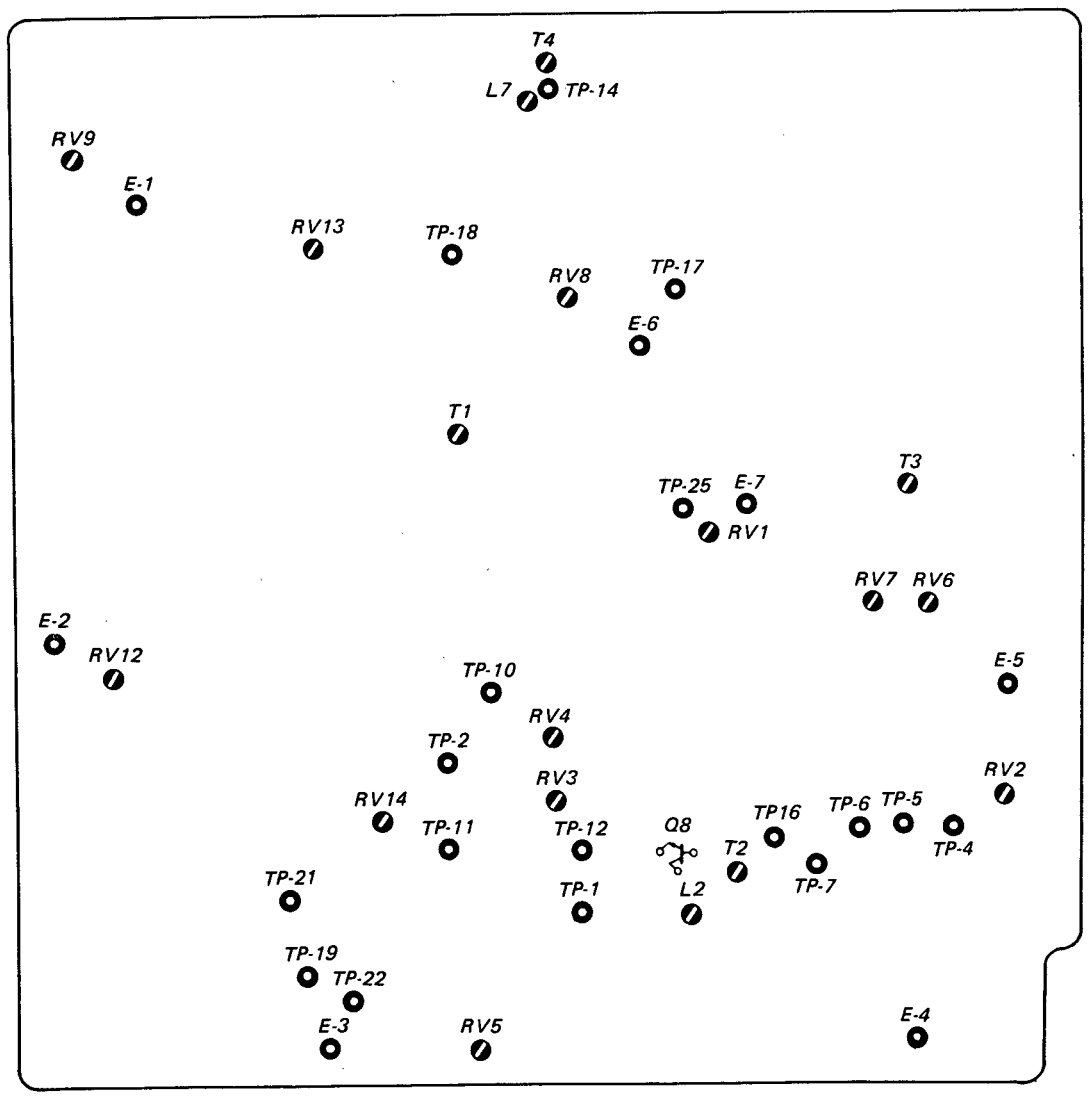
Oscilloscope, dual trace
Frequency Counter
PAL Colour Monitor

Note; The following delay lines are factory adjusted and does not need to adjust on regular service. When these delay lines replaced, select the same tap of former one.

DL1/DM-8 board
DL3/DM-8 board



RP-2A board

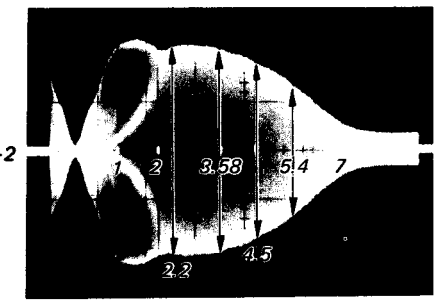


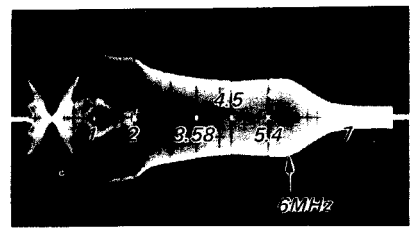
DM-8 board

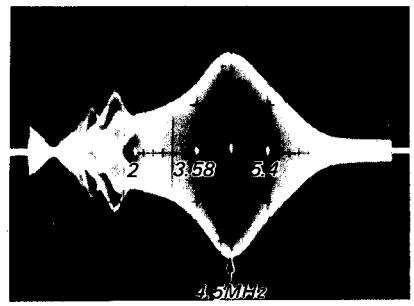
VIDEO

10-1 PLAYBACK RF AMPLIFIER ALIGNMENT

10-1-1 Playback RF Frequency Response Adjustment

<table>
<tr><th>machine conditions for adjustment</th><th>spec.</th><th>adjustment</th></tr>
<tr><td rowspan="4">• SYSTEM SELECT SW; PAL/SECAM
• TRACKING CONTROL; detent position
• Playback mode; RR5-1S PAL (RF Sweep segment)</td><td>(1) Frequency Responce check
TP-15/RP-2
 

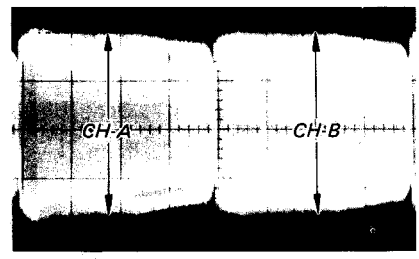
<table>
<tr><td>2.2MHz</td><td>3.58MHz</td><td>4.5MHz</td><td>5.4MHz</td></tr>
<tr><td>100%</td><td>100</td><td>90</td><td>65</td></tr>
<tr><td>Reference</td><td>±5%</td><td>±5%</td><td>±5%</td></tr>
</table>
Check to see that both the CH-A and CH-B waveforms meet the required specifications. If spec. is not met, adjust as follows.</td><td>EXT.TRIG; TP-13/RP-2
⊖ slope; CH-A
⊕ slope; CH-B</td></tr>
<tr><td>(2) 6MHz Tuning Adjustment
RV6/RP-2 (CH-A)
RV5/RP-2 (CH-B) > ↻ fully
RV7/RP-2 (CH-A)
RV8/RP-2 (CH-B) > ↺ fully
TP-15/RP-2
 
</td><td>CV2/RP-2 board (CH-A)
CV1/RP-2 board (CH-B)

EXT.TRIG; TP-13/RP-2
⊖ slope; CH-A
⊕ slope; CH-B</td></tr>
<tr><td>(3) 4.5MHz Tuning Adjustment
RV7/RP-2 (CH-A)
RV8/RP-2 (CH-B) > ↻ fully
TP-15/RP-2
 
</td><td>L17/RP-2 board (CH-A)
L18/RP-2 board (CH-B)

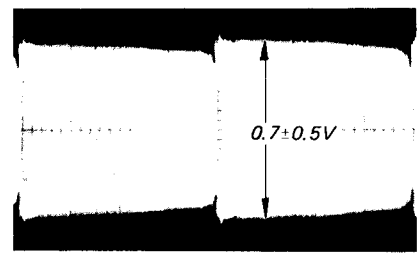
EXT.TRIG; TP-13/RP-2
⊖ slope; CH-A
⊕ slope; CH-B</td></tr>
<tr><td>(4) Equalizing adjustment
Adjust the following controls until the specifications in step (1) is met.</td><td>RV6/RP-2 (CH-A) } high freq.
RV5/RP-2 (CH-B) } range adj.

RV7/RP-2 (CH-A) } mid freq.
RV8/RP-2 (CH-B) } range adj.</td></tr>
</table>

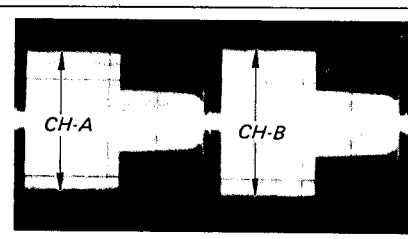
10-1-2. PLAYBACK Y-RF Output Balance Adjustment

machine conditions for adjustment	spec.	adjustment
• *SYSTEM SELECT SW; PAL/SECAM* • *TRACKING CONTROL; detent postion* • *Playback mode; RR5-1S PAL (Colour Bar segment)*	*TP-15/RP-2*  *CH-A = CH-B*	◐*RV9/RP-2 board* *EXT.TRIG; TP-13/RP-2*

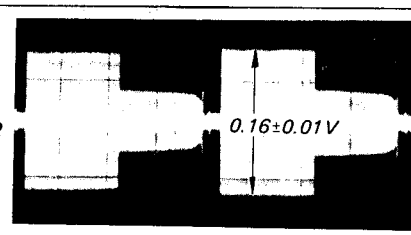
10-1-3. Playback Y-RF Output Level Adjustment

machine conditions for adjustment	spec.	adjustment
• *SYSTEM SELECT SW; PAL/SECAM* • *TRACKING CONTROL; detent postion* • *Playback mode; RR5-1S PAL (Colour Bar segment)*	*TP-15/RP-2*  	◐*RV11/RP-2 board* *EXT.TRIG; TP-13/RP-2*

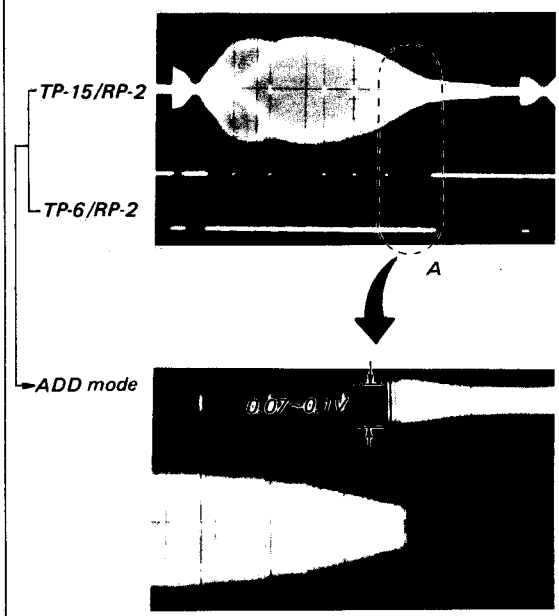
10-1-4. Playback Chroma-RF Output Balance Adjustment

machine conditions for adjustment	spec.	adjustment
• *SYSTEM SELECT SW; PAL/SECAM* • *TRACKING CONTROL; detent postion* • *Playback mode; RR5-1S PAL (Colour Bar segment)*	*TP-19/RP-2*  *CH-A = CH-B*	◐*RV10/RP-2 board* *EXT.TRIG; TP-13/RP-2*

10-1-5. Playback Chroma-RF Output Level Adjustment

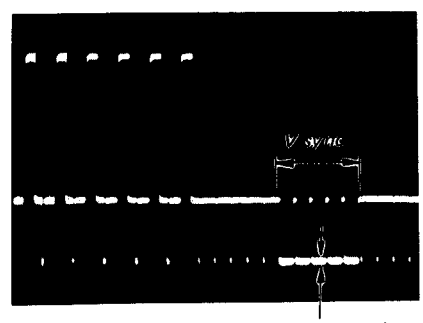
machine conditions for adjustment	spec.	adjustment
• *SYSTEM SELECT SW; PAL/SECAM* • *TRACKING CONTROL; detent postion* • *Playback mode; RR5-1S PAL (Colour Bar segment)*	*TP-19/RP-2*  	◐*RV12/RP-2 board* *EXT.TRIG; TP-13/RP-2*

10-1-6. Drop-out Compensator Sensitivity Adjustment

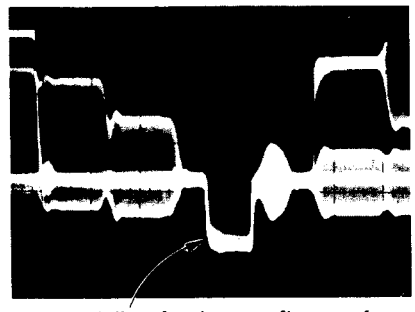
machine conditions for adjustment	spec.	adjustment
• *SYSTEM SELECT SW; PAL/SECAM* • *Playback mode; RR5-1S PAL (RF Sweep segment)*	*TP-15/RP-2* *TP-6/RP-2* *A* *ADD mode* 	*RV4/RP-2 board* *If the portion "A" corresponds to any frequency marker points of the waveshape, turn the TRACKING control until the portion "A" does not correspond to any marker point.* *EXT. TRIG; TP-13/RP-2*

10-2. Y-DEMODULATOR ALIGNMENT

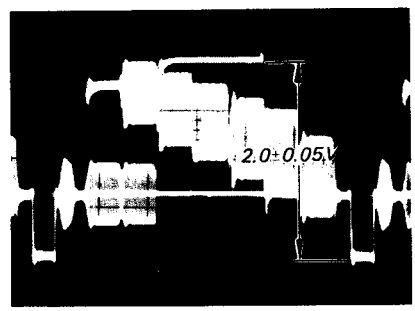
10-2-1. Y-Demodulator's Limiter Balance Adjustment

machine conditions for adjustment	spec.	adjustment
• *SYSTEM SELECT SW; PAL/SECAM* • *Playback mode; RR5-1S PAL (Colour Bar segment)*	*TP-9/DM-8*  *Minimum amplitude*	*RV13/DM-8 board* *EXT.TRIG; TP-2/DM-8*

10-2-2. Y-Frequency Response Adjustment

machine conditions for adjustment	spec.	adjustment
• *SYSTEM SELECT SW; PAL/SECAM* • *Playback mode; RR5-1S PAL (Colour Bar segment)*	*TP-21/DM-8*  *Adjust for the most flat waveform*	*RV12/DM-8 board* *EXT. TRIG; TP-18/DM-8*

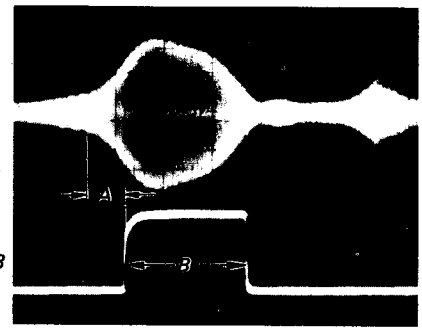
10-2-3. Y-Output Level Adjustment

machine conditions for adjustment	spec.	adjustment
• *SYSTEM SELECT SW; PAL/SECAM* • *Playback mode; RR5-1S PAL (Colour Bar segment)*	*TP-21/DM-8*  *2.0±0.05V*	*RV9/DM-8 board* *EXT. TRIG; TP-18/DM-8*

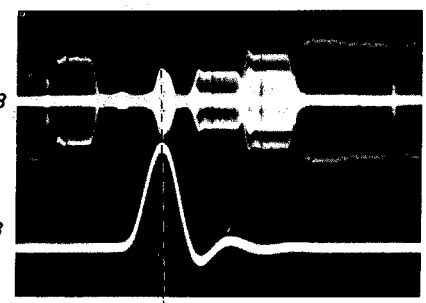
VIDEO

10-3. PLAYBACK CHROMA ALIGNMENT

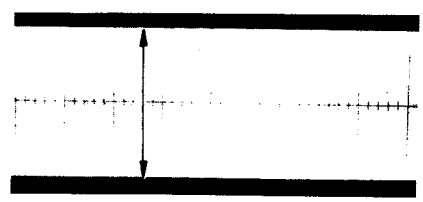
10-3-1. APC Burst Flag Phase/Width Adjustment

machine conditions for adjustment	spec.	adjustment
• *SYSTEM SELECT SW; PAL/SECAM* • *Playback mode; RR5-1S PAL*	*TP-11/DM-8* *CHOP mode* *TP-16/DM-8*  	*RV6/DM-8 board* *A=0.5±0.1μS* *RV7/DM-8 board* *B=2.5±0.1μS* *EXT. TRIG; TP-18/DM-8*

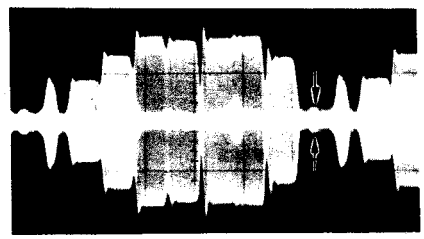
10-3-2. Playback ACC Burst Flag Phase Adjustment

machine conditions for adjustment	spec.	adjustment
• *SYSTEM SELECT SW; PAL/SECAM* • *Playback mode; RR5-1S PAL*	*TP-12/DM-8* *CHOP mode* *TP-18/DM-8*  *Both peaks should be in phase.*	*L7/DM-8 board* *EXT. TRIG; TP-18/DM-8*

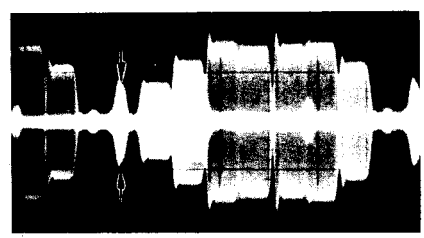
10-3-3. 5.12 MHz Tuning Adjustment

machine conditions for adjustment	spec.	adjustment
• *SYSTEM SELECT SW; PAL/SECAM* • *Playback mode; RR5-1S PAL* *(Colour bar segment)*	*TP-25/DM-8*  *Maximum amplitude*	*T3/DM-8 board*

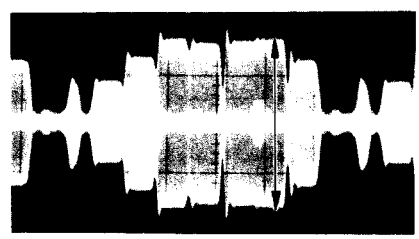
10-3-4. 4.43MHz Frequency Converter Balance Adjustment

machine conditions for adjustment	spec.	adjustment
• *SYSTEM SLELECT SW; PAL/SECAM* • *Playback mode; RR5-1S PAL (Colour bar segment)*	*TP-11/DM-8*  *Minimum amplitude*	*RV1/DM-8 board* *EXT. TRIG; TP-18/DM-8*

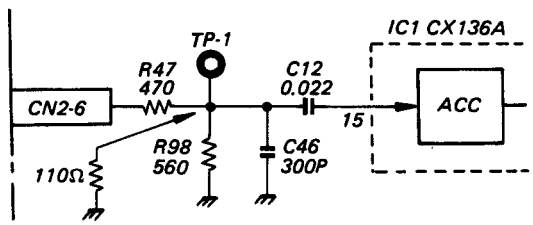
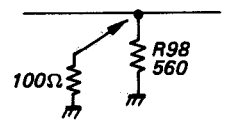
10-3-5. Playback ACC Burst Tuning Adjustment

machine conditions for adjustment	spec.	adjustment
• *SYSTEM SELECT SW; PAL/SECAM* • *Playback mode; RR5-1S PAL (Colour bar segment)*	*TP-12/DM-8*  *Minimum amplitude*	*T1/DM-8 board* *EXT. TRIG; TP-18/DM-8*

10-3-6. APC Gain Adjustment

machine conditions for adjustment	spec.	adjustment
• *SYSTEM SELECT SW; PAL/SECAM* • *Playback mode; RR5-1S PAL (Colour bar segment)*	*TP-12/DM-8*  *0.35±0.02V*	*RV3/DM-8* *EXT. TRIG; TP-18/DM-8*

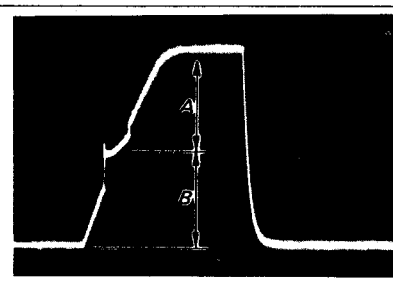
10-3-7. Playback Colour Killer Adjustment

machine conditions for adjustment	spec.	adjustment
• *SYSTEM SELECT SW; PAL/SECAM* • *TRACKING CONTROL; detent position* • *Temporarily connect a resistor 110Ω across R98.* • *Playback mode; RR5-1S PAL (Colour bar segment)*	*TP-10/DM-8*  	*RV4/DM-8 board* *fully* *(TP-10; 0Vdc MONITOR; B/W)* *RV4/DM-8 board* *Slowly up to the point indicating 4Vdc at TP-10. (MONITOR; Colour)*
	• *Change the resistor to 100Ω*  *Confirm that the TP-10 dc voltage is now 0Vdc. (MONITOR; B/W)* *If it is 4Vdc, repeat the adjustment. (MONITOR; Colour)*	

10-3-8. 4.43MHz Reference Oscillator Frequency Adjustment

machine conditions for adjustment	spec.	adjustment
• *SYSTEM SELECT SW; PAL/SECAM* • *Playback mode; RR5-1S PAL or RR4-7S SECAM*	*TP-8/DM-8* *4,433,618±10Hz*	*T2/DM-8 board*

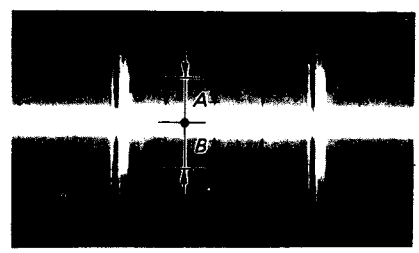
10-3-9. AFC VCO Frequency Adjustment

machine conditions for adjustment	spec.	adjustment
• *SYSTEM SELECT SW; PAL/SECAM* • *Playback mode; RR5-1S PAL (Colour bar segment)*	*TP-17/DM-8*  *A=B*	*RV8/DM-8 board*

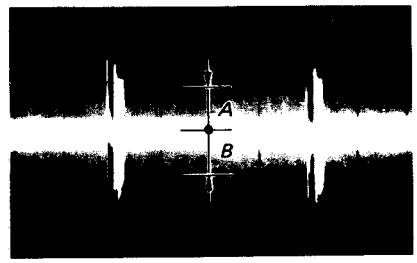
10-3-10. 3.58MHz Local Oscillator Frequency Adjustment

machine conditions for adjustment	spec.	adjustment
• *Playback mode.*	*TP-14/DM-8* *3,579,545±50Hz*	*T4/DM-8 board*

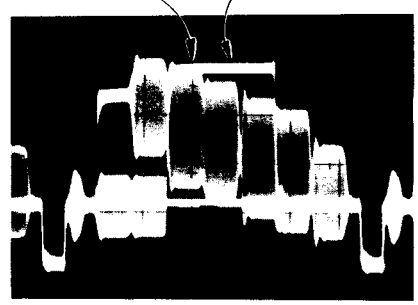
10-3-11. APC VCO Frequency Adjustment

machine conditions for adjustment	spec.	adjustment
• *SYSTEM SELECT SW; PAL/SECAM* • *Short TP-4 ⟷ TP-6/DM-8 with jumper* • *Playback mode; RR5-1S PAL (Colour bar segment)*	*TP-5/DM-8 : scope CH-A*) *ADD* *TP-7/DM-8 (INVERT); scope CH-B*) *mode*  *A=B*	*L2/DM-8 board* *Correct HUE is obtained on monitor.* *EXT. TRIG; TP-2/DM-8*

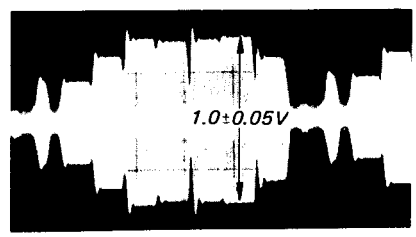
10-3-12 Colour Lock Control Calibration

machine conditions for adjustment	spec.	adjustment
• *SYSTEM SELECT SW; PAL/SECAM* • *COLOUR LOCK CONTROL; detent position* • *Playback mode; RR5-1S PAL (Colour bar segment)*	*TP-5/DM-8 ; scope CH-A*) *ADD* *TP-7/DM-8 (INVERT); scope CH-B*) *mode*  *A=B*	*RV2/DM-8 board* *Correct HUE is obtained on monitor.* *EXT. TRIG; TP-2/DM-8*

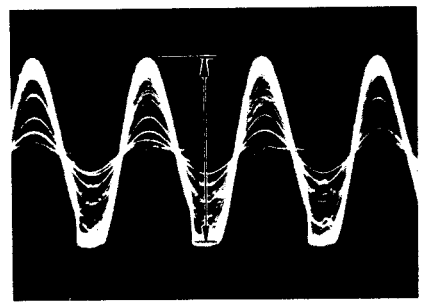
10-3-13. Chroma Output Level Adjustment

machine conditions for adjustment	spec.	adjustment
• *SYSTEM SELECT SW; PAL/SECAM* • *Playback mode; RR5-1S PAL (Colour bar segment)*	*cyan peak* *100% white peak* *TP-21/DM-8*  *Cyan peak = 100% white peak*	*RV14/DM-8 board* *EXT. TRIG; TP-18/DM-8*

10-3-14. Dub Chroma Output Level Adjustment

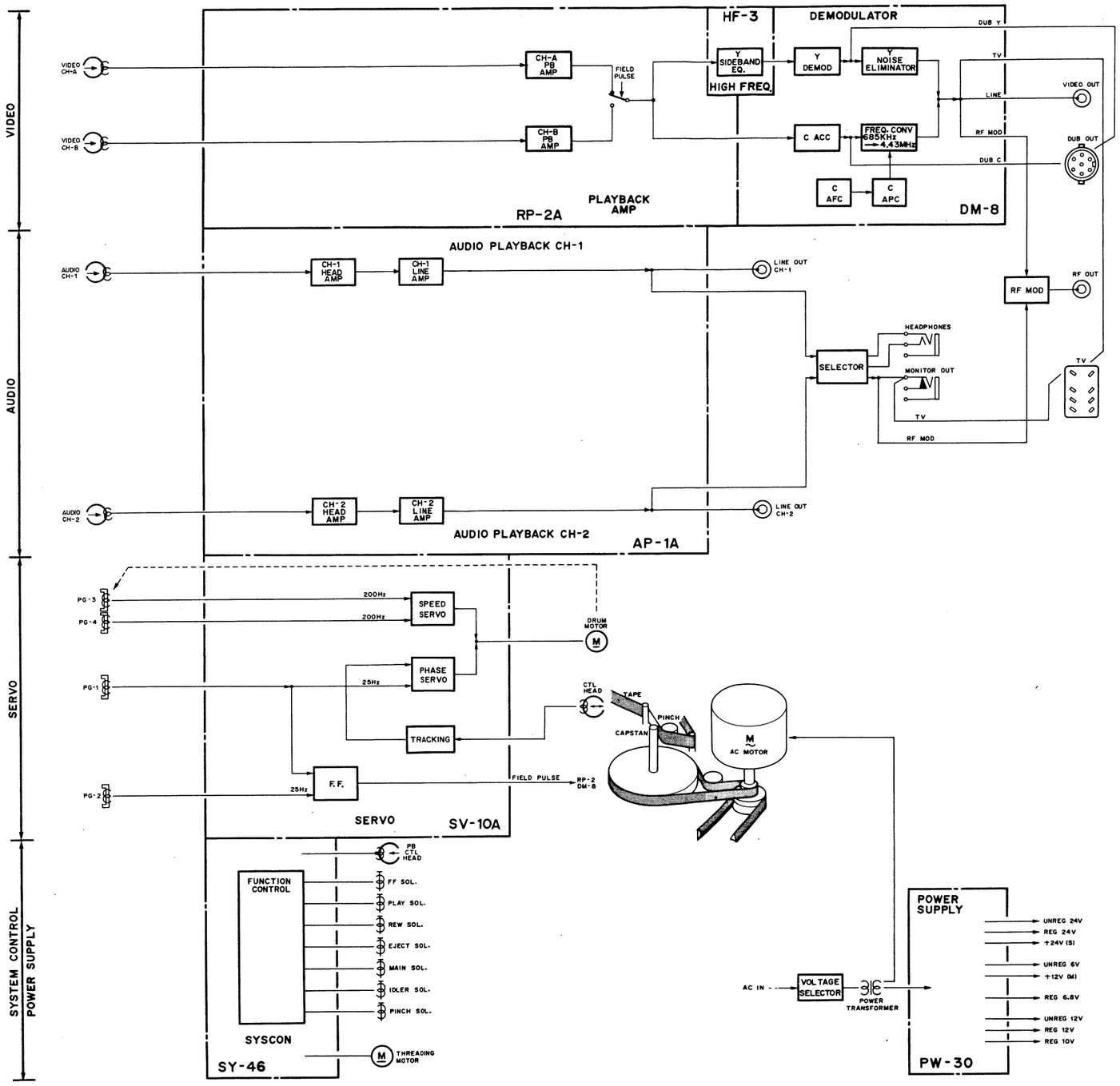
machine conditions for adjustment	spec.	adjustment
• *SYSTEM SELECT SW; PAL/SECAM* • *Playback mode; RR5-1S PAL (colour bar segment)*	*TP-22/DM-8*  	*RV5/DM-8 board* *EXT. TRIG; TP-18/DM-8*

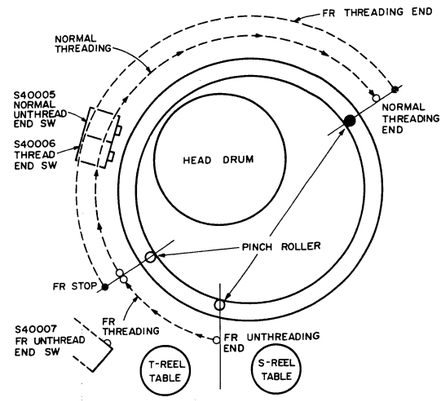
10-4. SECAM SIGNAL DETECTOR FH/2 TUNING

machine conditions for adjustment	spec.	adjustment
• *SYSTEM SELECT SW; PAL/SECAM* • *Playback mode; RR4-7S SECAM*	*TP-18/RP-2*  *Maximum amplitude*	*L5/RP-2 board*

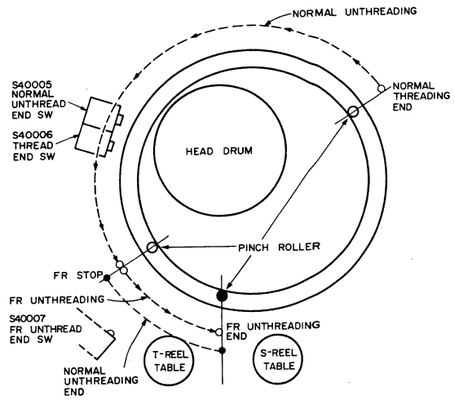
SECTION 11
BLOCK DIAGRAMS

OVERALL BLOCK DIAGRAM



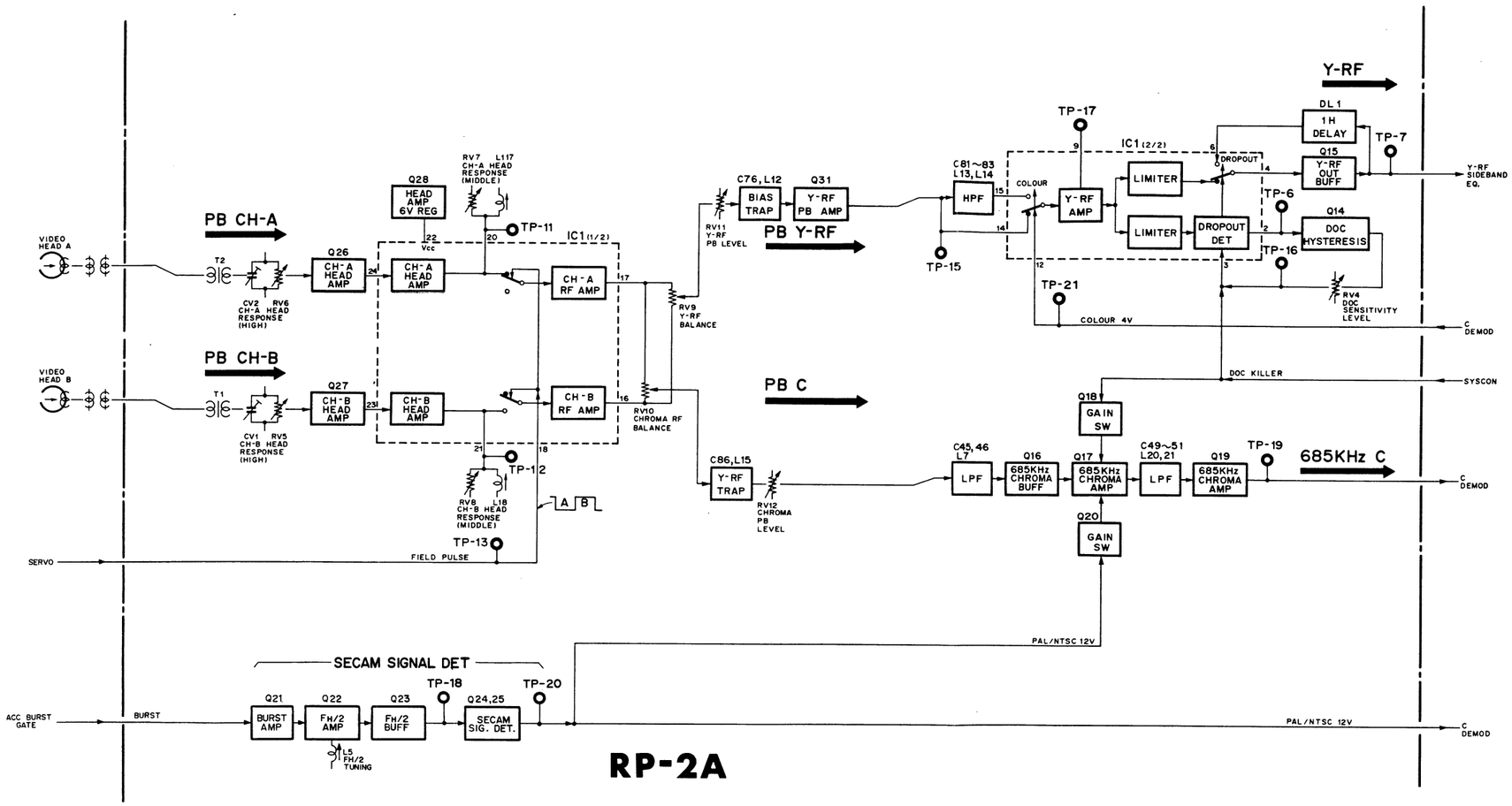


THREADING MODE



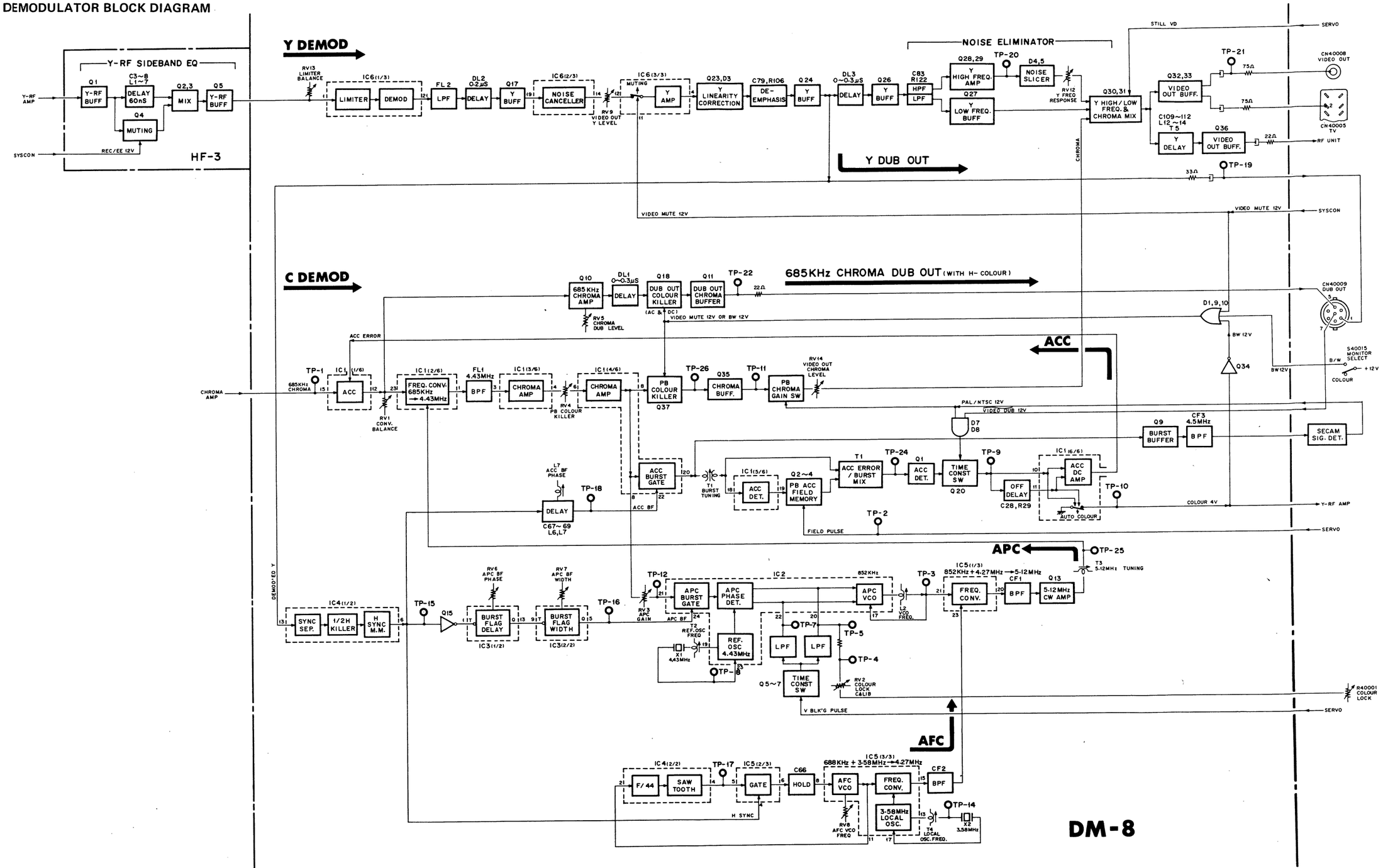
UNTHREADING MODE

Y/C PB AMPLIFIER BLOCK DIAGRAM

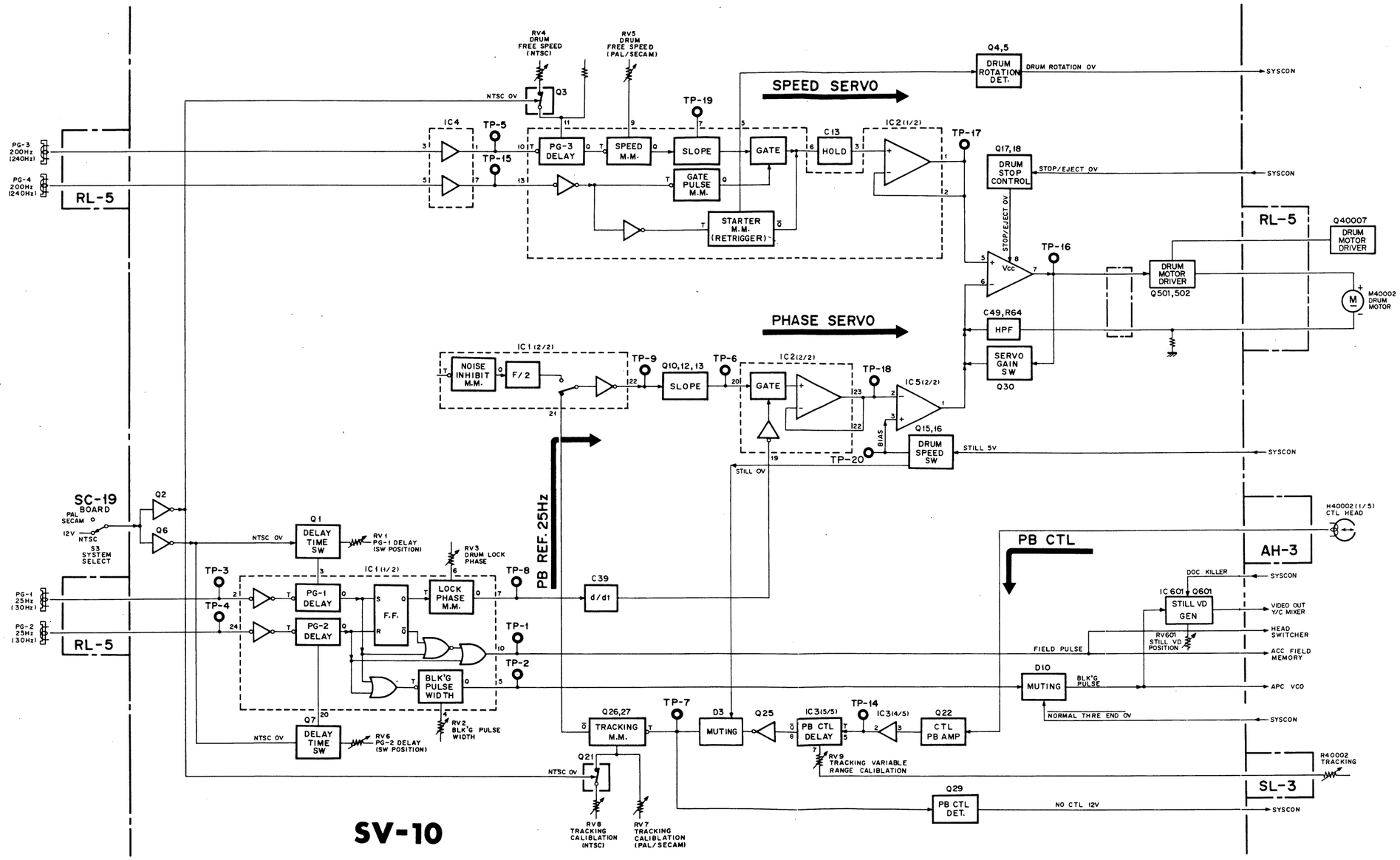


RP-2A

Y/C DEMODULATOR BLOCK DIAGRAM

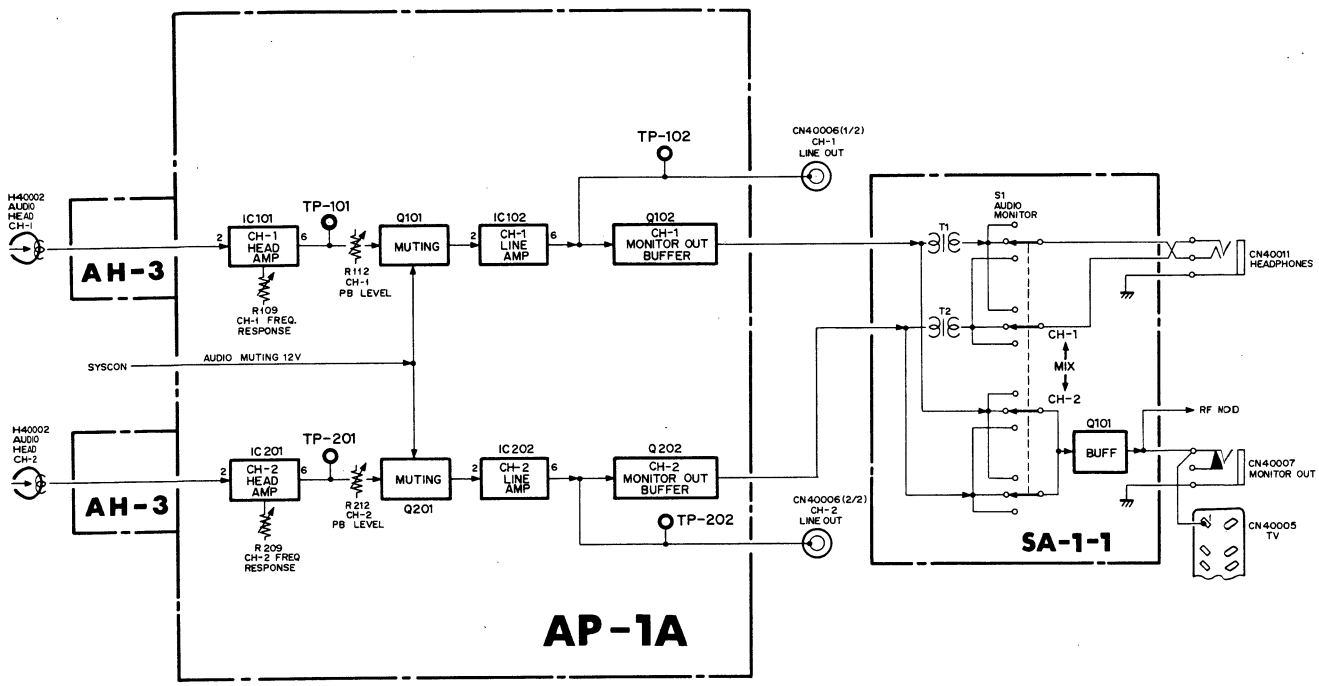


SERVO SYSTEM BLOCK DIAGRAM



SV-10

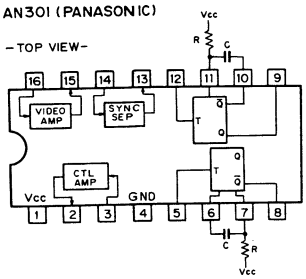
AUDIO SYSTEM BLOCK DIAGRAM



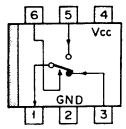
SECTION 12
PRINTED WIRING BOARDS AND SCHEMATIC DIAGRAMS

IC

AN301 (PANASONIC)

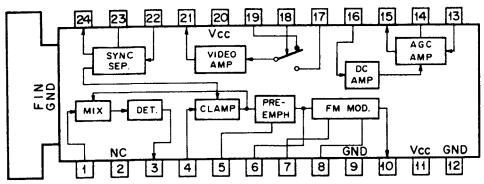


CX130 (SONY)
ANALOG SWITCH
— TOP VIEW —

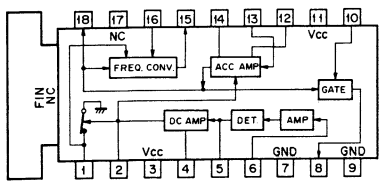


CONT. INPUT (PIN6)	SW
LOW OR OPEN	
HIGH	

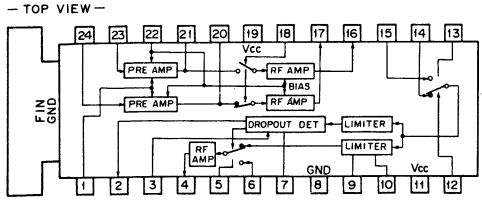
CX131A (SONY)
— TOP VIEW —



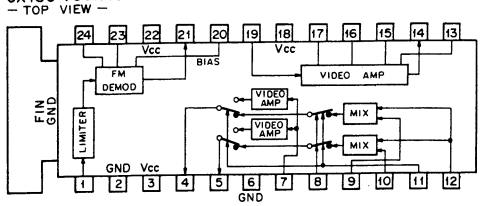
CX133A (SONY)
— TOP VIEW —



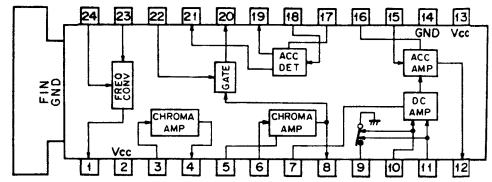
CX134A (SONY)
— TOP VIEW —



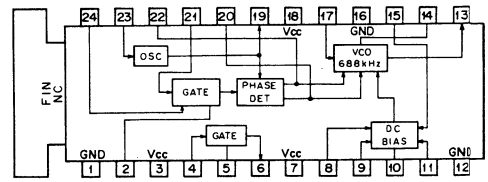
CX135 (SONY)
— TOP VIEW —



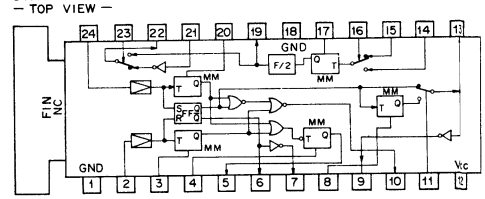
CX136A (SONY)
— TOP VIEW —



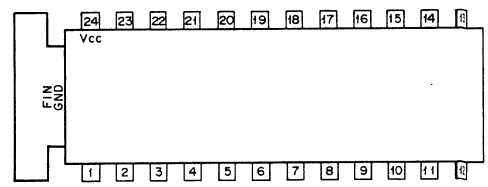
CX137A (SONY)
— TOP VIEW —

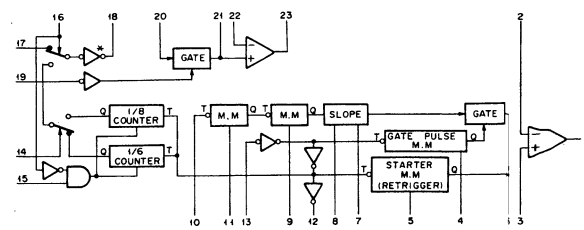


CX138 (SONY)
— TOP VIEW —

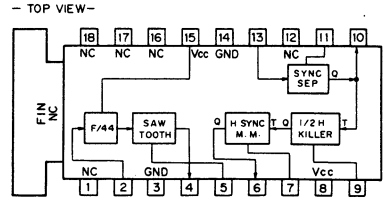


CX143A (SONY)
— TOP VIEW —



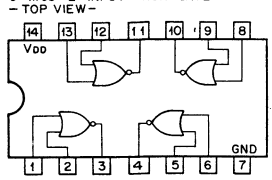


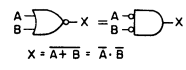
CX145 (SONY)
— TOP VIEW —



CD4001AE/BE (RCA)
TC4001BP (TOSHIBA)
TC4001UBP (TOSHIBA)

C-MOS 2-INPUT NOR GATE
— TOP VIEW —

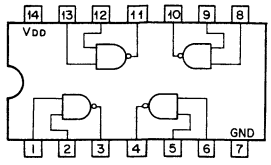


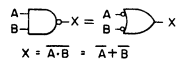


A	B	X
L	L	H
L	H	L
H	L	L
H	H	L

CD4011AE/BE (RCA)
TC4011BP (TOSHIBA)
TC4011UBP (TOSHIBA)

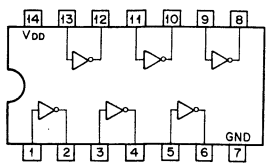
C-MOS 2-INPUT NAND GATE
— TOP VIEW —

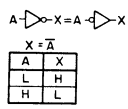




A	B	X
L	L	H
L	H	H
H	L	H
H	H	L

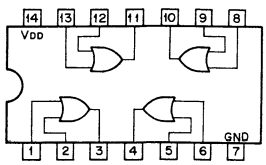
CD4069BE (RCA)
MSM4069 (OKI)
TC4069UBP (TOSHIBA)
C-MOS INVERTER
— TOP VIEW —

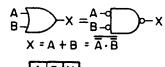




A	X
L	H
H	L

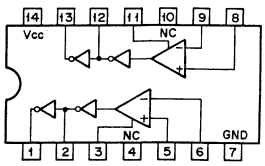
CD4071BE (RCA)
TC4071BP (TOSHIBA)
C-MOS 2-INPUT OR GATE
— TOP VIEW —



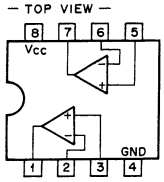


A	B	X
L	L	L
L	H	H
H	L	H
H	H	H

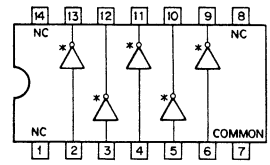
HA1807 (HITACHI)
VOLTAGE COMPARATOR
— TOP VIEW —

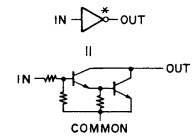


LM1458N (NSC)
HA17458GS (HITACHI)
μPC1458C (NEC)
OPERATIONAL AMPLIFIER
— TOP VIEW —

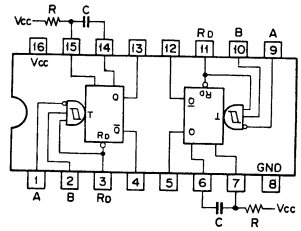


M54516P (MITSUBISHI)
TRANSISTOR ARRAY
— TOP VIEW —





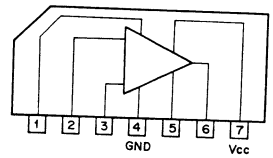
SN74LS221N (TI)
TTL MONOSTABLE MULTIVIBRATOR WITH SCHMITT TRIGGER INPUT
— TOP VIEW —



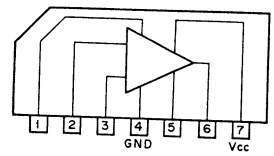
INPUTS			OUTPUTS	
RD	A	B	Q	Q̄
L	X	X	L	H
X	H	X	L	H
X	X	L	L	H
H	L	↑	⊓	⊔
H	↓	H	⊓	⊔
↑	L	H	⊓	⊔

OUTPUT PULSE WIDTH = 0.7CR

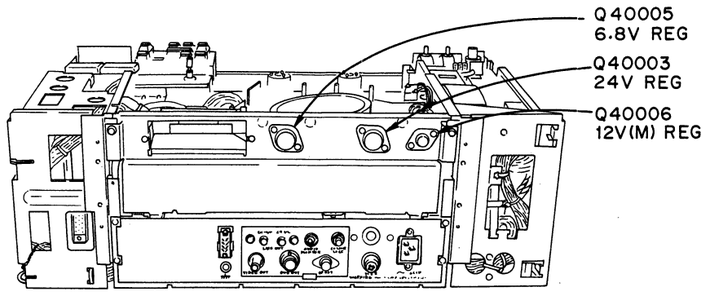
TA7120P (TOSHIBA)
LOW NOISE PREAMPLIMITER
— SIDE VIEW —

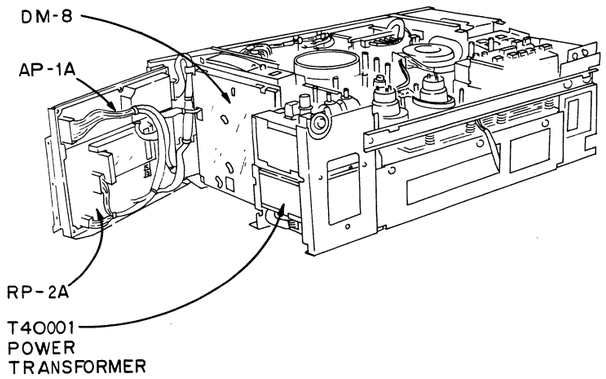


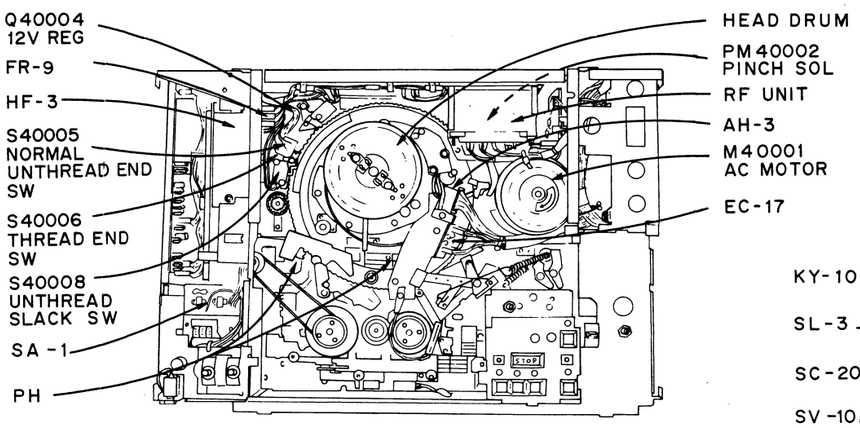
TA7122AP (TOSHIBA)
PRE/EQUALIZER AMP
— SIDE VIEW —

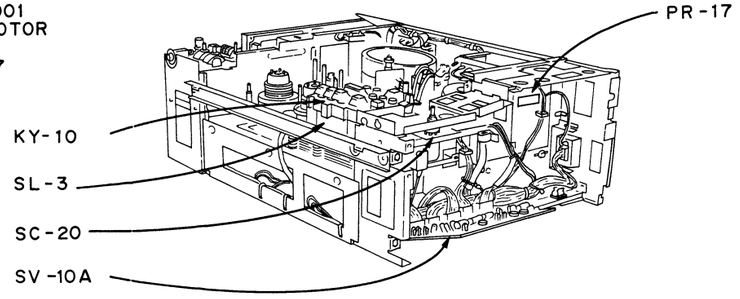


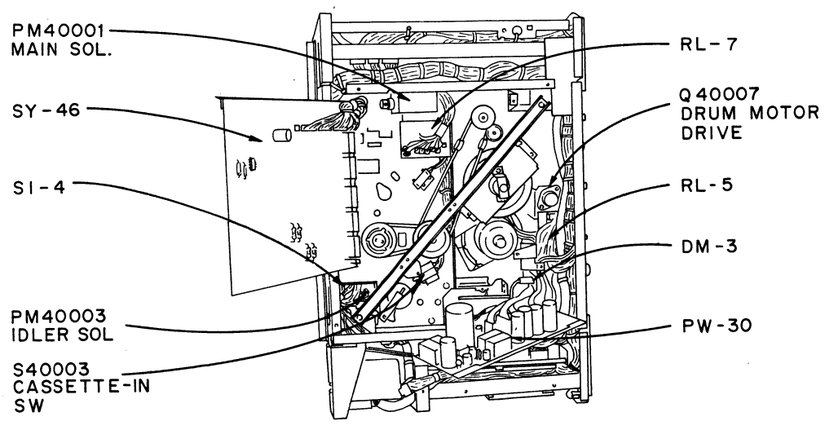
MAIN PARTS LOCATION



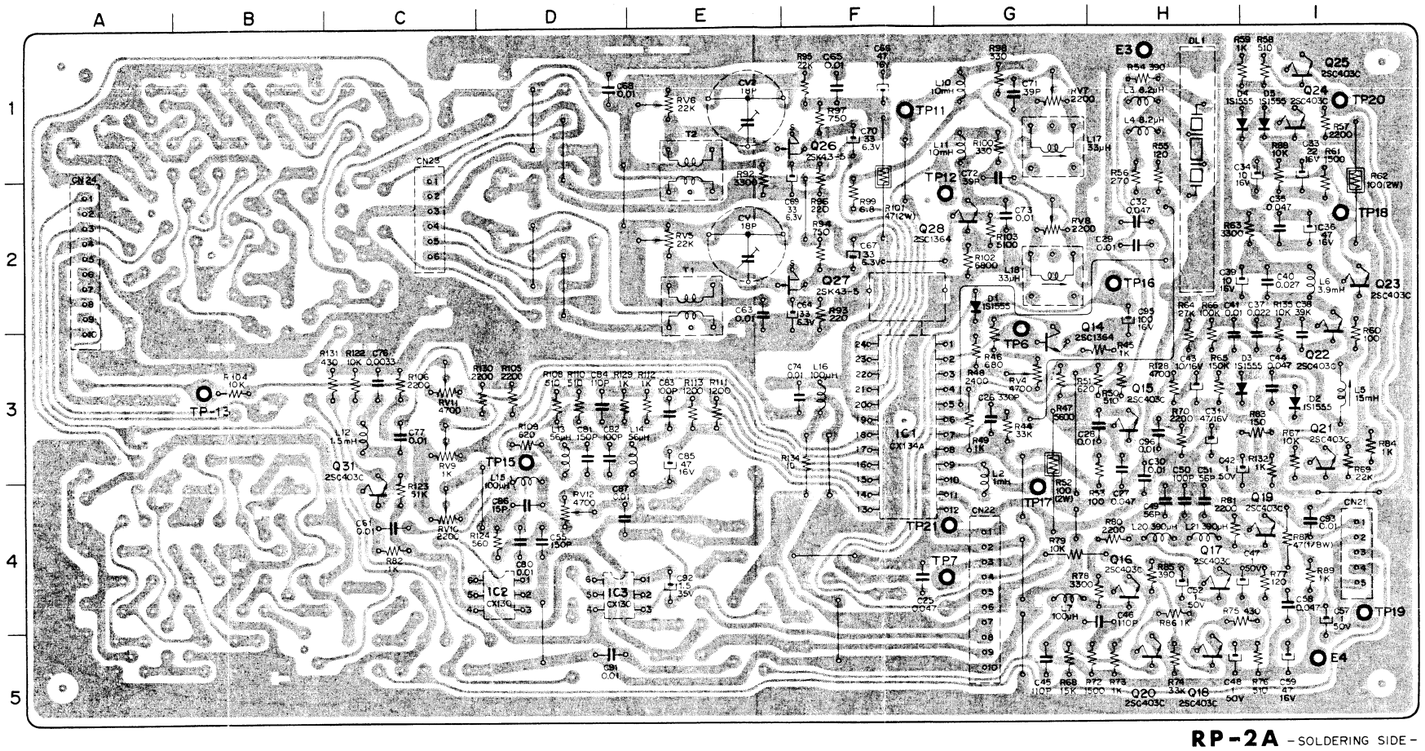






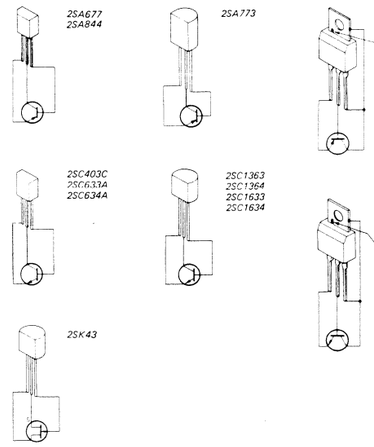


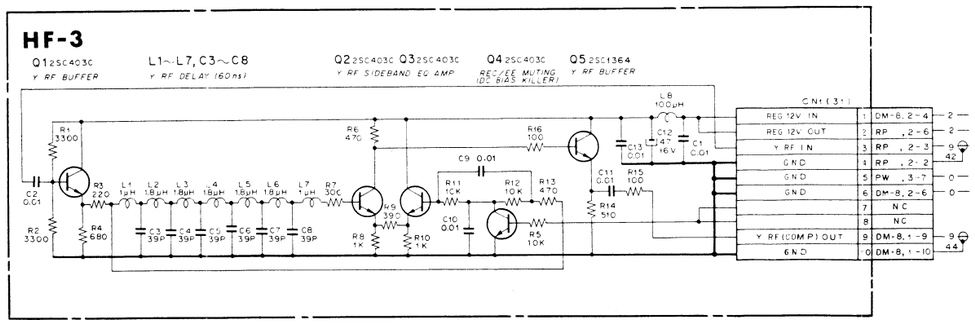
RP-2A (Y/C PB AMPLIFIER)
HF-3 (PB Y RF SIDEBAND EQ.)

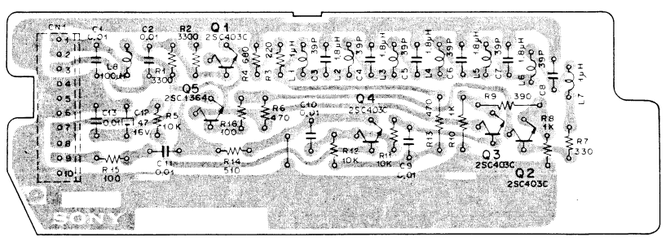


RP-2A – SOLDERING SIDE –

CN21	I-4	Q14	G-3	RV3	B-5
CN22	G-4	Q15	H-3	RV4	G-3
CN23	C-2	Q16	H-4	RV5	E-2
CN24	A-2	Q17	H-4	RV6	E-1
CV1	E-2	Q18	H-5	RV7	G-1
CV2	E-1	Q19	I-4	RV8	G-2
D1	G-2	Q20	H-5	RV9	C-3
D2	I-3	Q21	I-3	RV10	C-4
D3	I-3	Q22	I-3	RV11	C-3
D4	I-1	Q23	I-2	RV12	D-4
D5	I-1	Q24	I-1		
		Q25	I-1		
		Q26	F-1		
		Q27	F-2		
		Q28	G-2		
E3	H-1	Q31	C-4	TP6	G-3
E4	I-5			TP7	G-4
				TP11	F-1
				TP12	G-2
				TP13	B-3
				TP15	D-3
IC1	F-3			TP16	H-2
IC2	D-4			TP17	G-4
IC3	D-4			TP18	I-2
L5	I-3			TP19	I-4
L17	G-1			TP20	I-1
L18	G-2			TP21	G-4

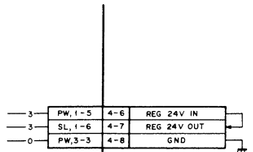


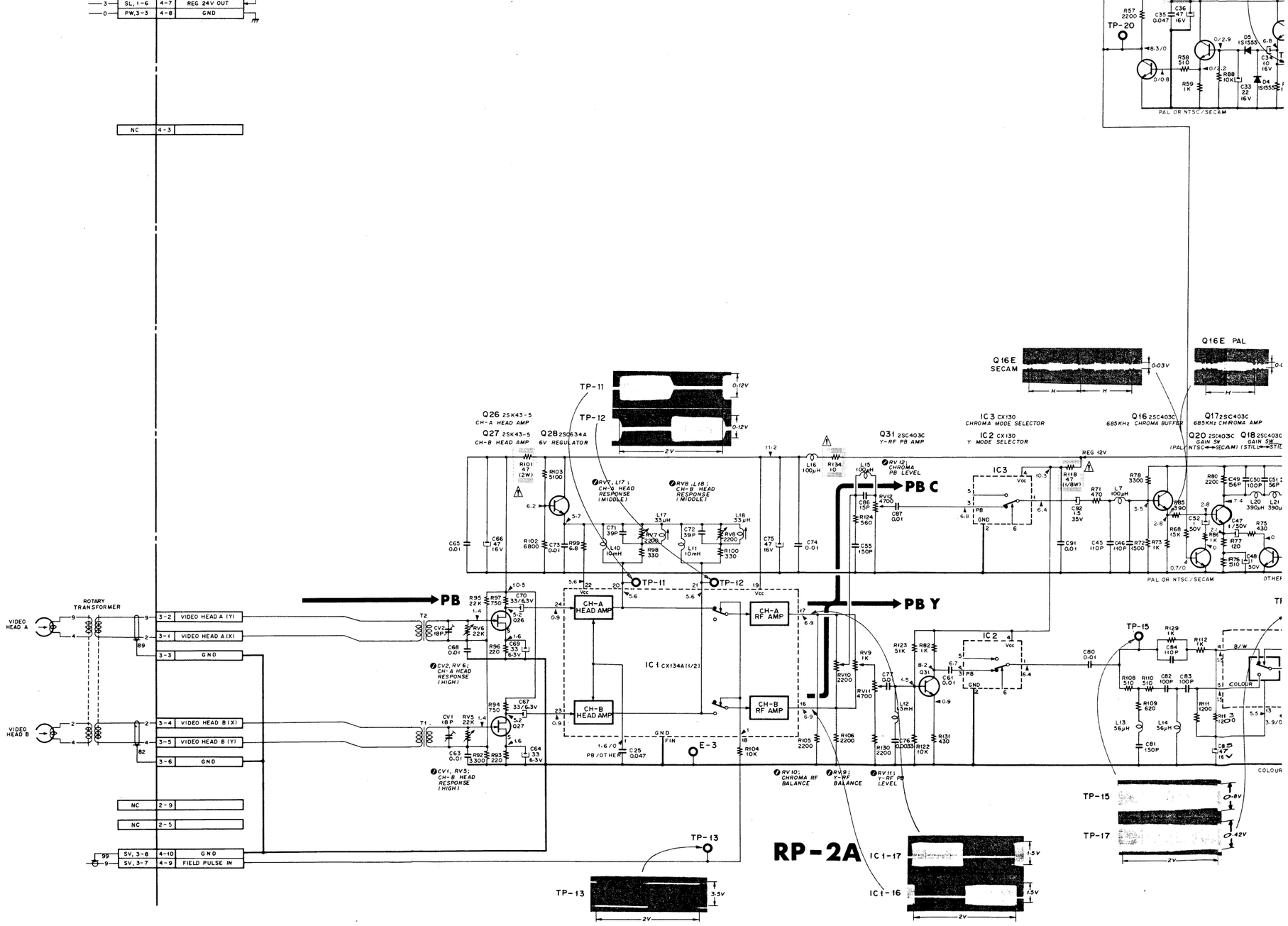




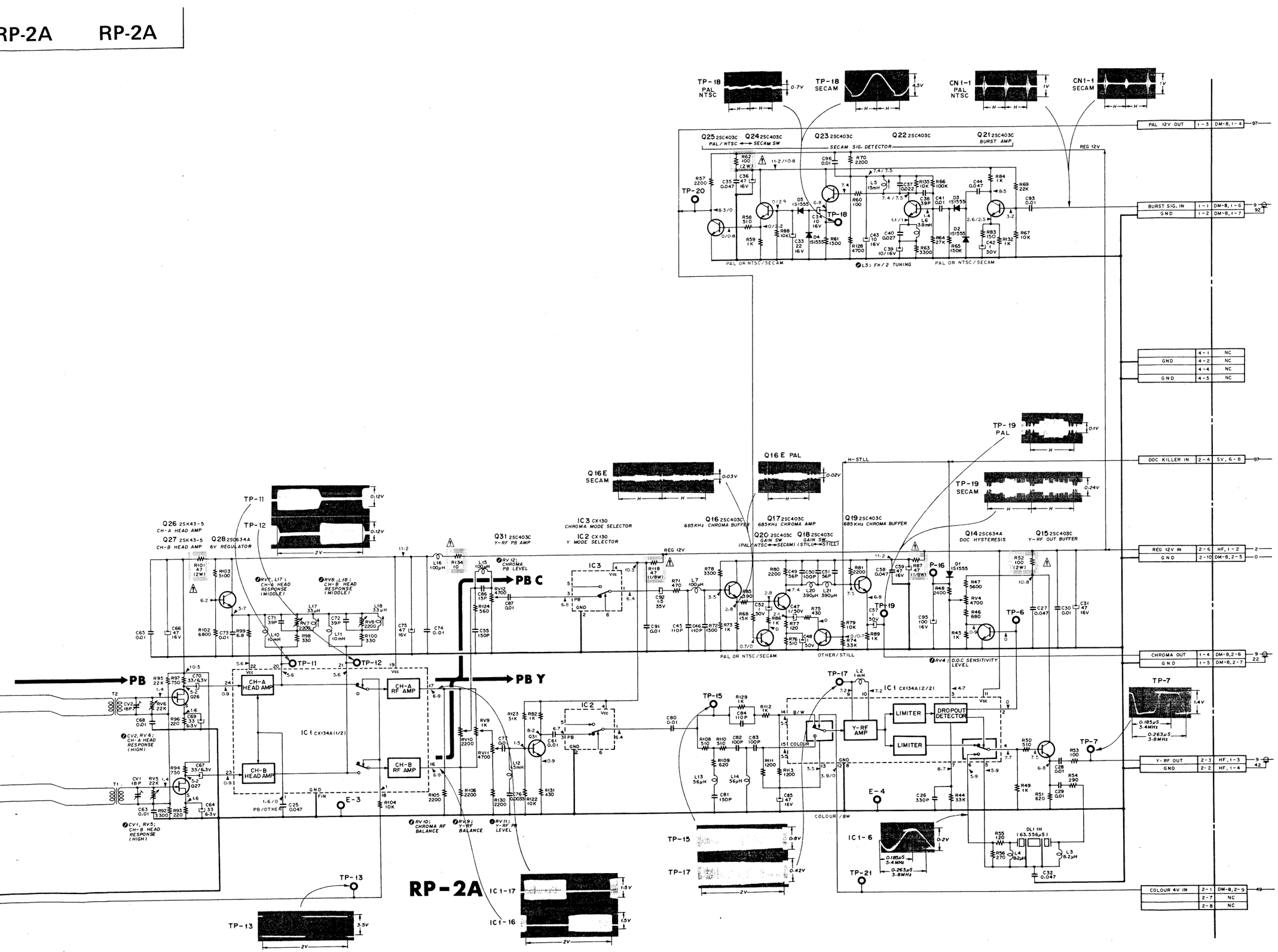
HF-3 – SOLDERING SIDE –

RP-2A (Y/C PB AMPLIFIER)



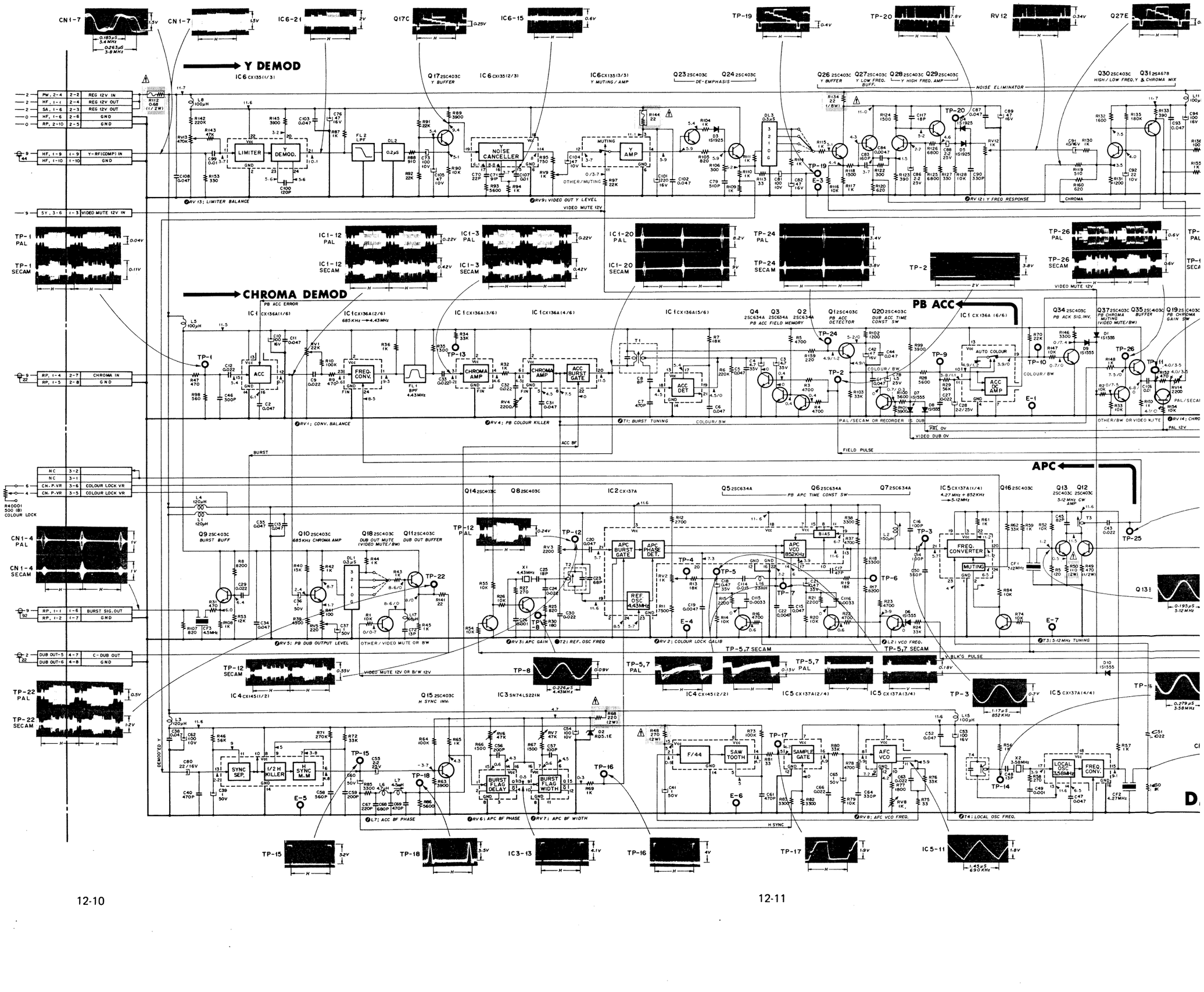


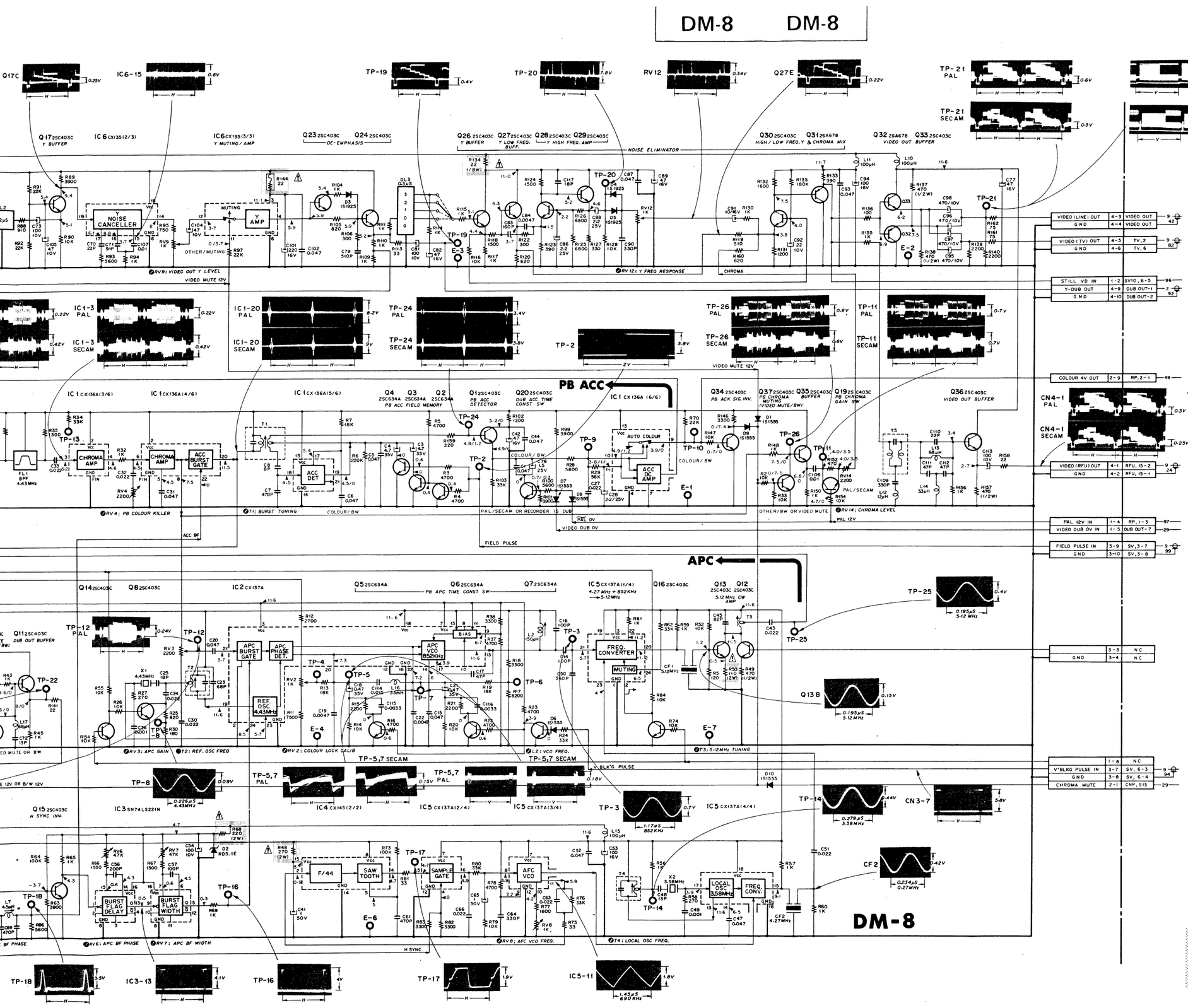
The shaded and ⚠-marked components are critical to safety.
Replace only with same components as specified.


TP-18 PAL NTSC
TP-18 SECAM
CN1-1 PAL NTSC
CN1-1 SECAM
Q25 2SC403C Q24 2SC403C PAL/NTSC ⟷ SECAM SW
Q23 2SC403C
Q22 2SC403C
Q21 2SC403C BURST AMP
SECAM SIG. DETECTOR
REG 12V
PAL 12V OUT
BURST SIG. IN
GND
TP-20
TP-18
PAL OR NTSC/SECAM
L5: FH/2 TUNING
PAL OR NTSC/SECAM
GND
GND
Q16E SECAM
Q16E PAL
TP-19 PAL
H-STLL
DOC KILLER IN
TP-19 SECAM
Q26 2SK43-5 CH-A HEAD AMP
Q27 2SK43-5 CH-B HEAD AMP
Q28 2SD634A 6V REGULATOR
TP-11
TP-12
IC3 CX130 CHROMA MODE SELECTOR
IC2 CX130 Y MODE SELECTOR
Q31 2SC403C Y-RF PB AMP
Q16 2SC403C 685KHz CHROMA BUFFER
Q17 2SC403C 685KHz CHROMA AMP
Q19 2SC403C 685KHz CHROMA BUFFER
Q20 2SC403C GAIN SW (PAL/NTSC ⟷ SECAM)
Q18 2SC403C GAIN SW (STILL ⟷ STILL)
Q14 2SC634A DOC HYSTERESIS
Q15 2SC403C Y-RF OUT BUFFER
REG 12V
REG 12V IN
GND
P-16
TP-19
TP-6
PAL OR NTSC/SECAM
OTHER/STILL
RV4: D.O.C SENSITIVITY LEVEL
CHROMA OUT
GND
PB C
PB
PB Y
CH-A HEAD AMP
CH-B HEAD AMP
CH-A RF AMP
CH-B RF AMP
IC1 CX134A(1/2)
TP-11
TP-12
GND
FIN
E-3
PB/OTHER
RV1, L17: CH-A HEAD RESPONSE (MIDDLE)
RV8, L18: CH-B HEAD RESPONSE (MIDDLE)
CV2, RV6: CH-A HEAD RESPONSE (HIGH)
CV1, RV5: CH-B HEAD RESPONSE (HIGH)
RV10: CHROMA RF BALANCE
RV9: Y-RF BALANCE
RV11: Y-RF PB LEVEL
TP-15
TP-17
TP-13
RP-2A
IC1-17
IC1-16
TP-17
IC1 CX134A(2/2)
TP-15
R129 1K
R84 1K
C84 110P
R112 1K
C80 0.01
B/W
Y-RF AMP
LIMITER
LIMITER
DROPOUT DETECTOR
151 COLOUR
COLOUR/BW
E-4
IC1-6
TP-21
TP-7
TP-7
DL1 1H (63.556μS)
Y-RF OUT
GND
COLOUR 4V IN

DM-8 DM-8

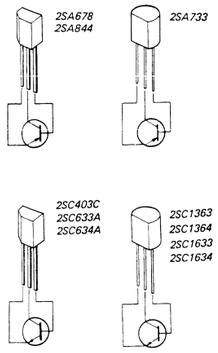
DM-8 (Y/C DEMODULATOR)



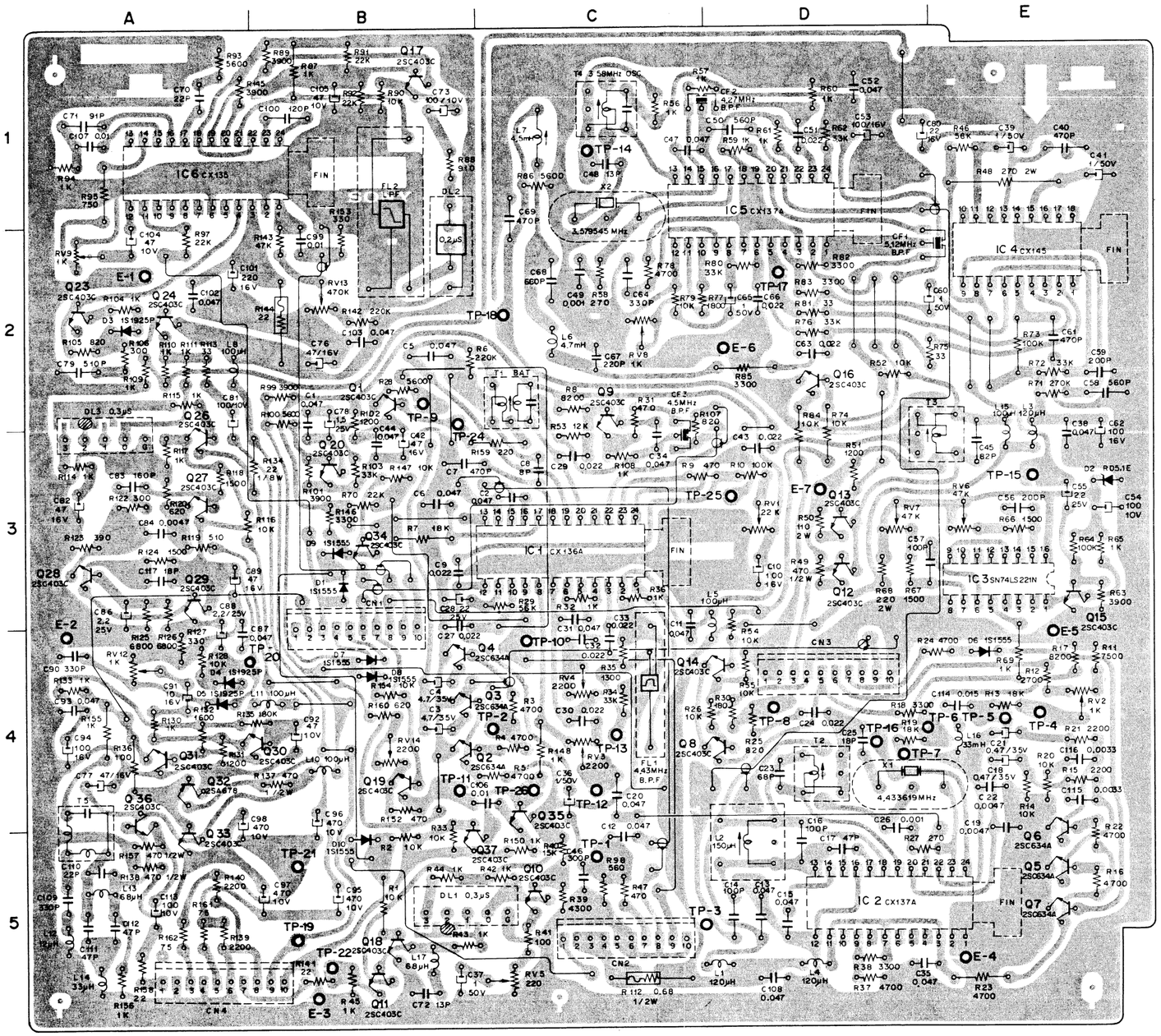


The shaded and ⚠-marked components are critical to safety.
Replace only with same component as specified.

DM-8 (Y/C DEMODULATOR)

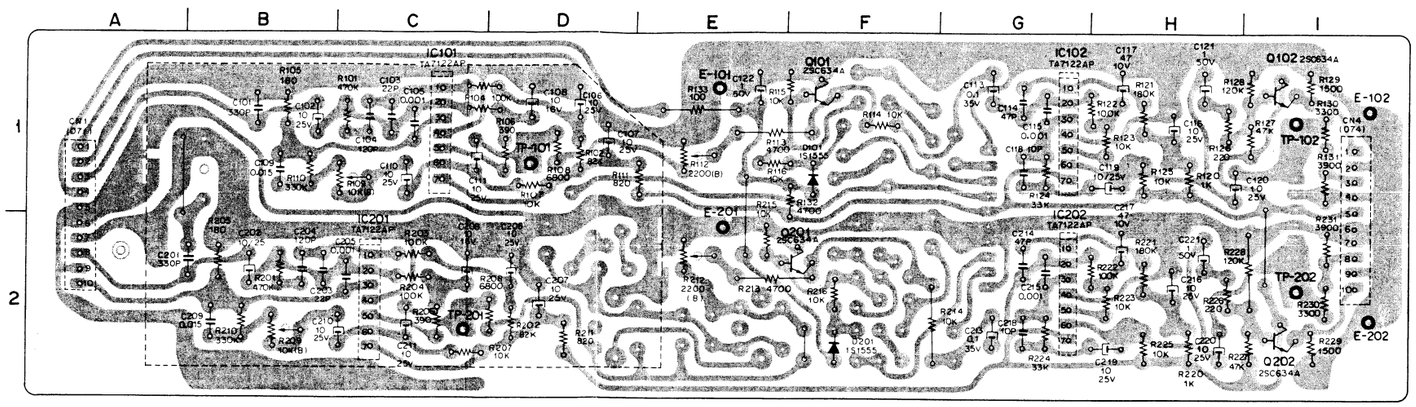


CF-1	E - 2	Q1	B - 2	RV1	D - 3
CF2	D - 1	Q2	B - 4	RV2	E - 4
CF3	C - 2	Q3	B - 4	RV3	C - 4
		Q4	B - 4	RV4	C - 4
CN1	B - 4	Q5	E - 5	RV5	C - 5
CN2	C - 5	Q6	E - 5	RV6	E - 3
CN3	D - 4	Q7	E - 5	RV7	D - 3
CN4	A - 5	Q8	D - 4	RV8	C - 2
		Q9	C - 2	RV9	A - 2
D1	B - 3	Q10	C - 5	RV12	A - 4
D2	E - 3	Q11	B - 5	RV13	B - 2
D3	A - 2	Q12	D - 3	RV14	B - 4
D4	A - 4	Q13	D - 3		
D5	A - 4	Q14	D - 4	T1	C - 2
D6	E - 4	Q15	E - 3	T2	D - 4
D7	B - 4	Q16	D - 2	T3	E - 3
D8	B - 4	Q17	B - 1	T4	C - 1
D9	B - 3	Q18	B - 3	T5	A - 4
D10	B - 5	Q19	B - 4		
		Q20	B - 3	TP-1	C - 5
DL1	B - 5	Q23	A - 2	TP-2	C - 4
DL2	B - 2	Q24	A - 2	TP-3	D - 5
DL3	A - 3	Q26	A - 3	TP-4	E - 4
		Q27	A - 3	TP-5	E - 4
E-1	A - 2	Q28	A - 3	TP-6	E - 4
E-2	A - 4	Q29	A - 3	TP-7	D - 4
E-3	B - 5	Q30	B - 4	TP-8	D - 4
E-4	E - 5	Q31	A - 4	TP-9	B - 2
E-5	E - 4	Q32	A - 4	TP-10	C - 4
E-6	D - 2	Q33	A - 5	TP-11	B - 4
E-7	D - 3	Q34	B - 3	TP-12	C - 4
		Q35	C - 4	TP-13	C - 4
FL1	C - 4	Q36	A - 4	TP-14	C - 1
FL2	B - 1	Q37	C - 5	TP-15	E - 3
				TP-16	D - 4
IC1	C - 3			TP-17	D - 2
IC2	D - 5			TP-18	C - 2
IC3	E - 3			TP-19	B - 5
IC4	E - 2			TP-20	A - 4
IC5	D - 1			TP-21	B - 5
IC6	A - 1			TP-22	B - 5
				TP-24	B - 2
L2	D - 5			TP-25	D - 3
L7	C - 1			TP-26	C - 4
				X1	D - 4
				X2	C - 1



DM-8 – SOLDERING SIDE –

AP-1A (AUDIO PB AMPLIFIER)
SA-1 (SYSTEM/AUDIO SELECTOR)



AP-1A – SOLDERING SIDE –

CN1 A · 1
CN4 I · 1

D101 F · 1
D201 F · 2

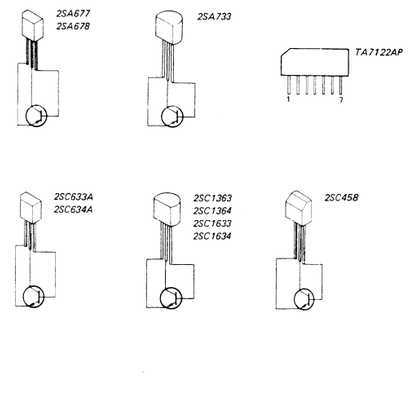
E101 E · 1
E102 I · 1
E201 E · 2
E202 I · 2

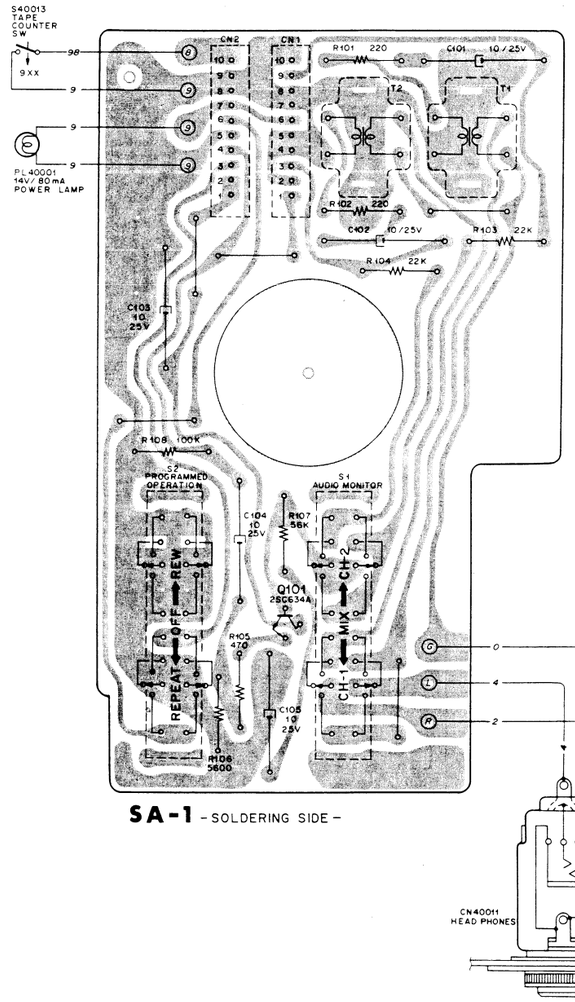
IC101 C · 1
IC102 G · 1
IC201 C · 2
IC202 G · 2

Q101 F · 1
Q102 I · 1
Q201 F · 2
Q202 I · 2

R109 C · 1
R112 E · 1
R209 B · 2
R212 E · 2

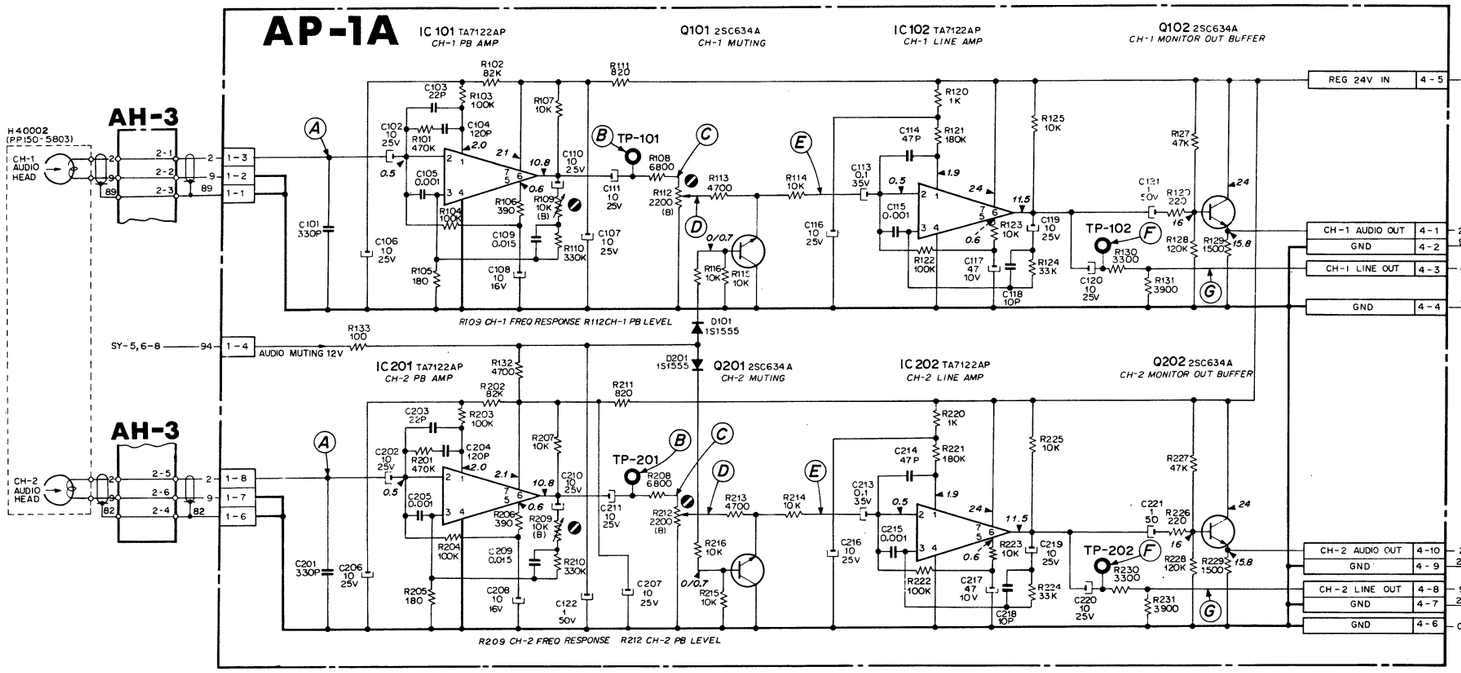
TP-101 D · 1
TP-102 I · 1
TP-201 C · 2
TP-202 I · 2

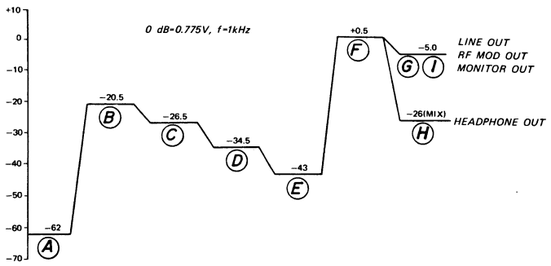


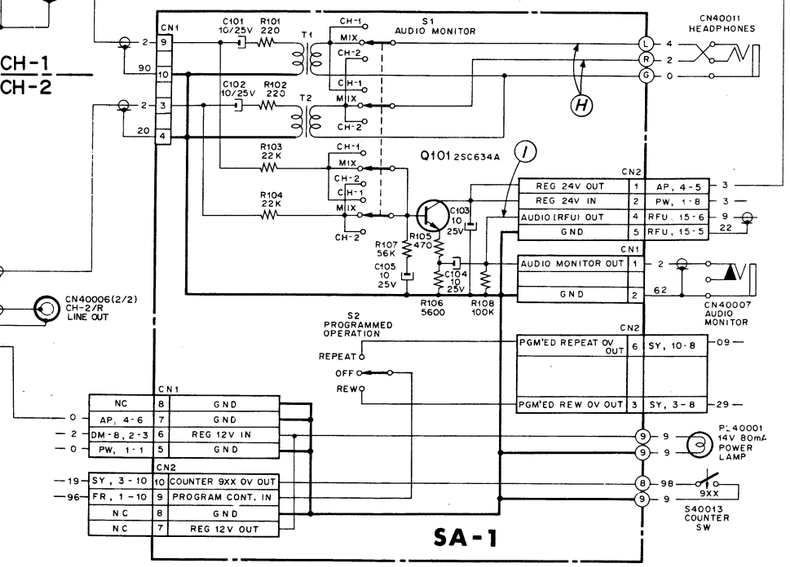


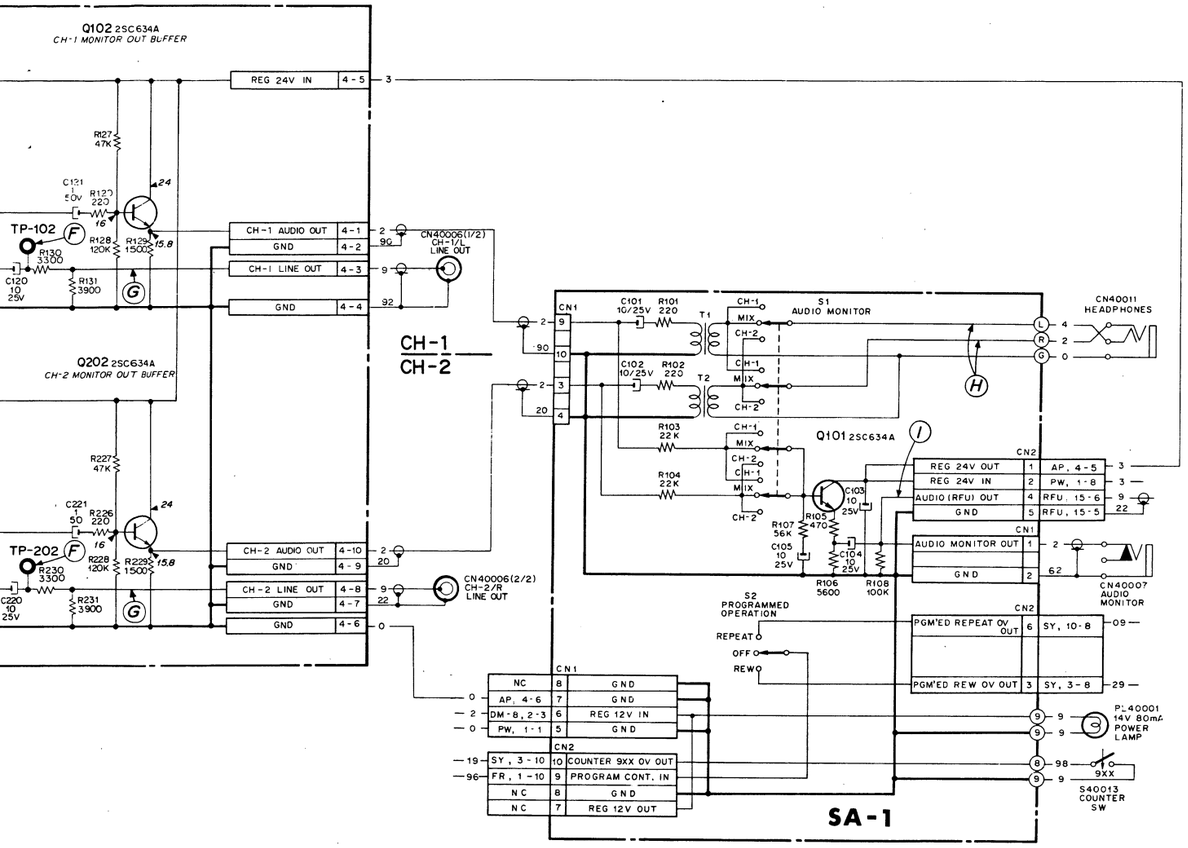
SA-1 – SOLDERING SIDE –

AP-1A (AUDIO PB AMPLIFIER)
SA-1 (SYSTEM/AUDIO SELECTOR)

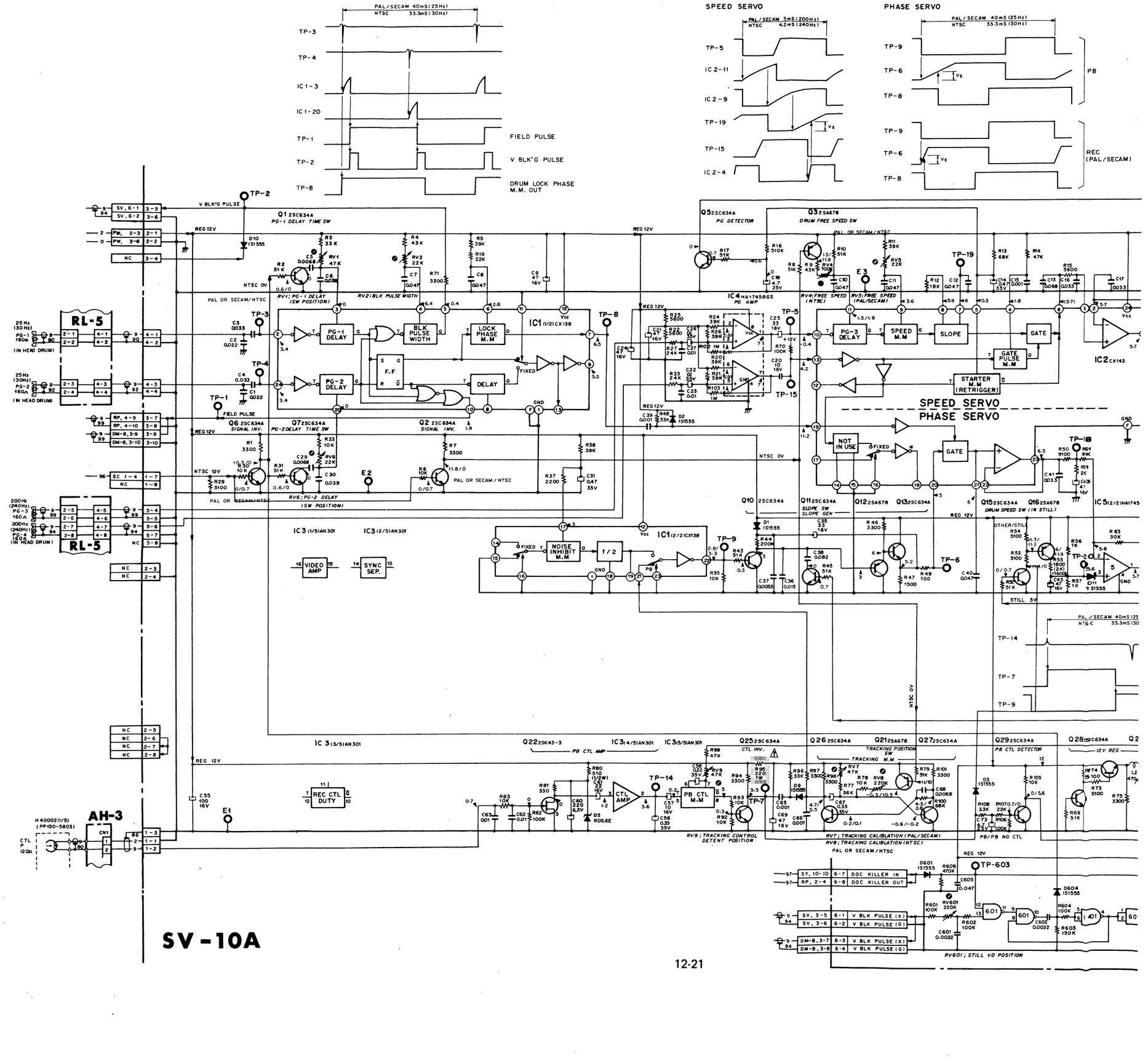


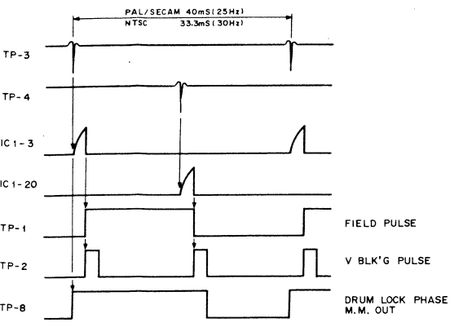


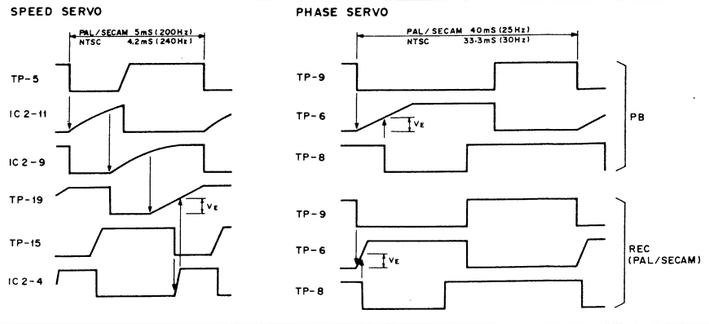


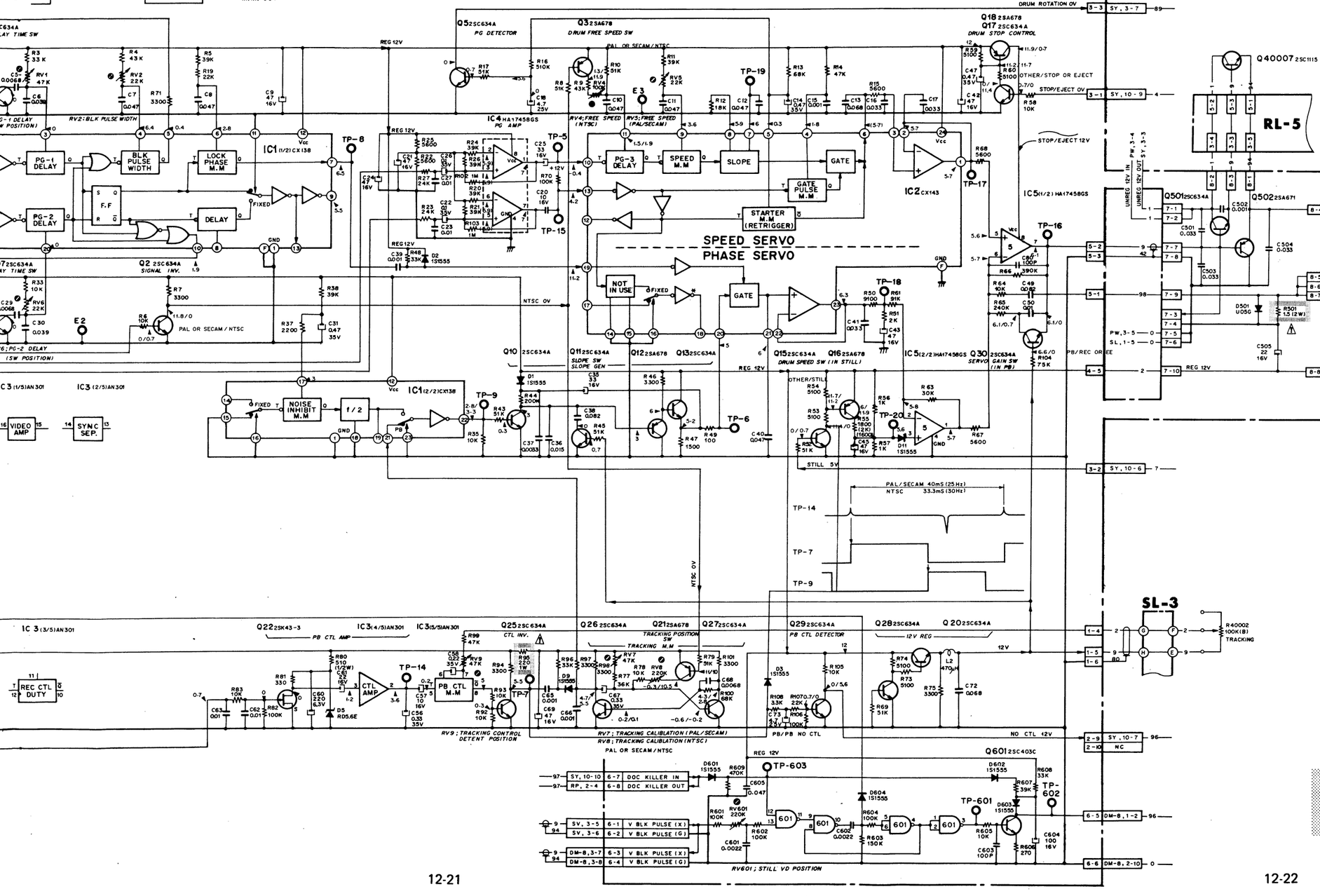

Q102 2SC634A
CH-1 MONITOR OUT BUFFER
REG 24V IN 4-5
R127 47K
C121 50V
R127 220
TP-102
R128 120K
R129 1500
R130 3300
C120 10 25V
R131 3900
CH-1 AUDIO OUT 4-1
GND 4-2
CH-1 LINE OUT 4-3
GND 4-4
CN40006(1/2) CH-1/L LINE OUT
Q202 2SC634A
CH-2 MONITOR OUT BUFFER
R227 47K
C221 50
R226 220
TP-202
R228 120K
R229 1500
R230 3300
C220 10 25V
R231 3900
CH-2 AUDIO OUT 4-10
GND 4-9
CH-2 LINE OUT 4-8
GND 4-7
GND 4-6
CN40006(2/2) CH-2/R LINE OUT
CH-1
CH-2
CN1
C101 10/25V
R101 220
T1
C102 10/25V
R102 220
T2
R103 22K
R104 22K
S1 AUDIO MONITOR
CH-1 MIX
CH-2 MIX
Q101 2SC634A
C103 10 25V
R105 470
R107 56K
C105 10 25V
R106 5600
C104 10 25V
R108 100K
CN40011 HEADPHONES
L
R
G
H
I
CN2
REG 24V OUT 1 AP, 4-5
REG 24V IN 2 PW, 1-8
AUDIO (RFU) OUT 4 RFU, 15-6
GND 5 RFU, 15-5
CN1
AUDIO MONITOR OUT 1
GND 2
CN40007 AUDIO MONITOR
S2 PROGRAMMED OPERATION
REPEAT
OFF
REWO
CN2
PGM'ED REPEAT OV OUT 6 SY, 10-8
PGM'ED REW OV OUT 3 SY, 3-8
CN1
NC 8 GND
AP, 4-6 7 GND
DM-8, 2-3 6 REG 12V IN
PW, 1-1 5 GND
CN2
SY, 3-10 10 COUNTER 9XX OV OUT
FR, 1-10 9 PROGRAM CONT. IN
NC 8 GND
NC 7 REG 12V OUT
PL40001 14V 80mA POWER LAMP
9XX
S40013 COUNTER SW
SA-1

SV-10A (SERVO)
RL-5



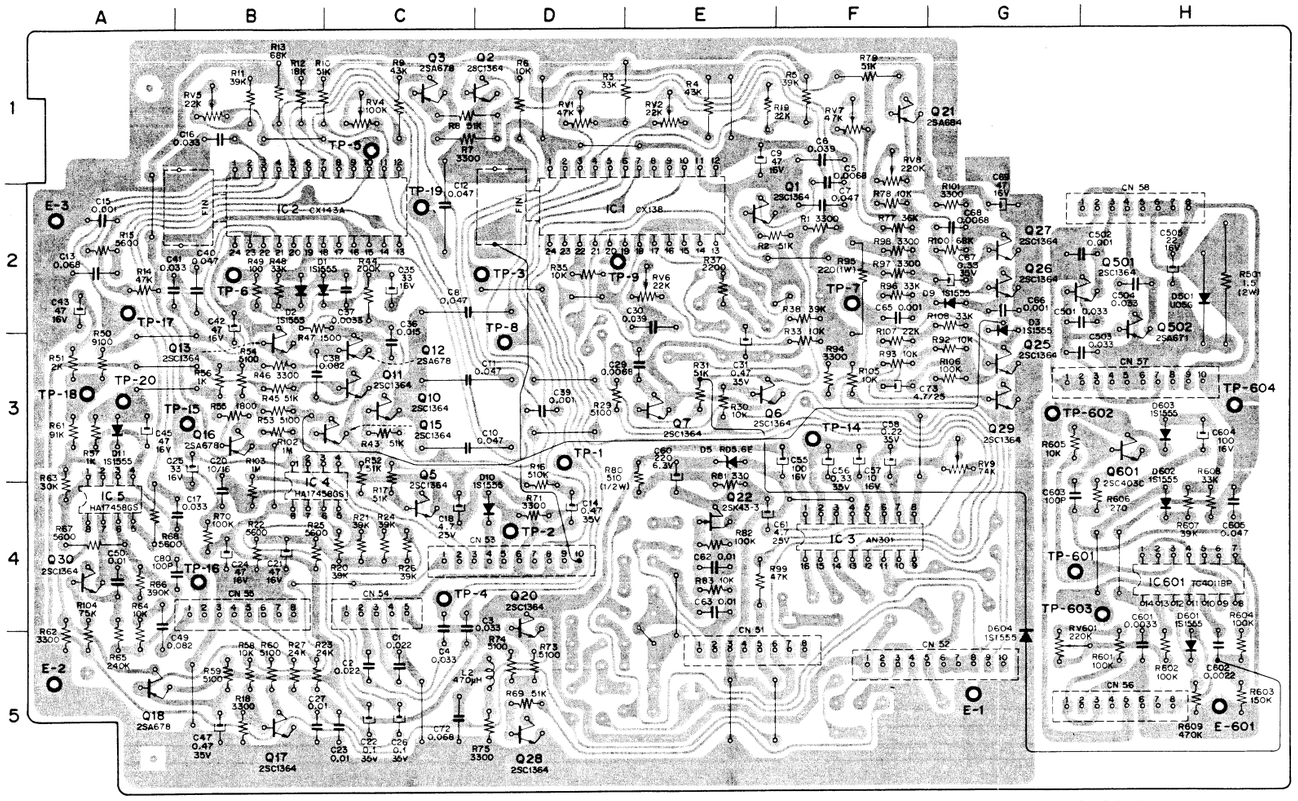




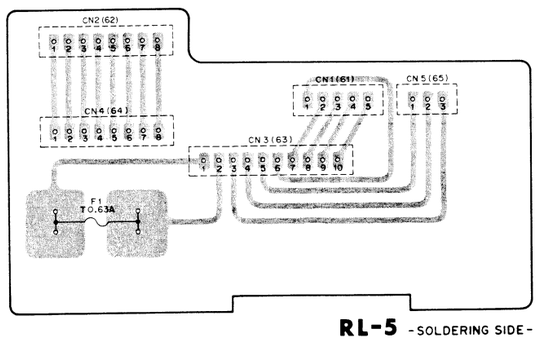


The shaded and ⚠-marked components are critical to safety.
Replace only with same component as specified.

SV-10A (SERVO)
RL-5

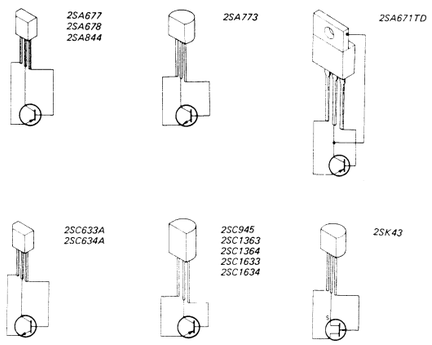


SV-10A - SOLDERING SIDE -

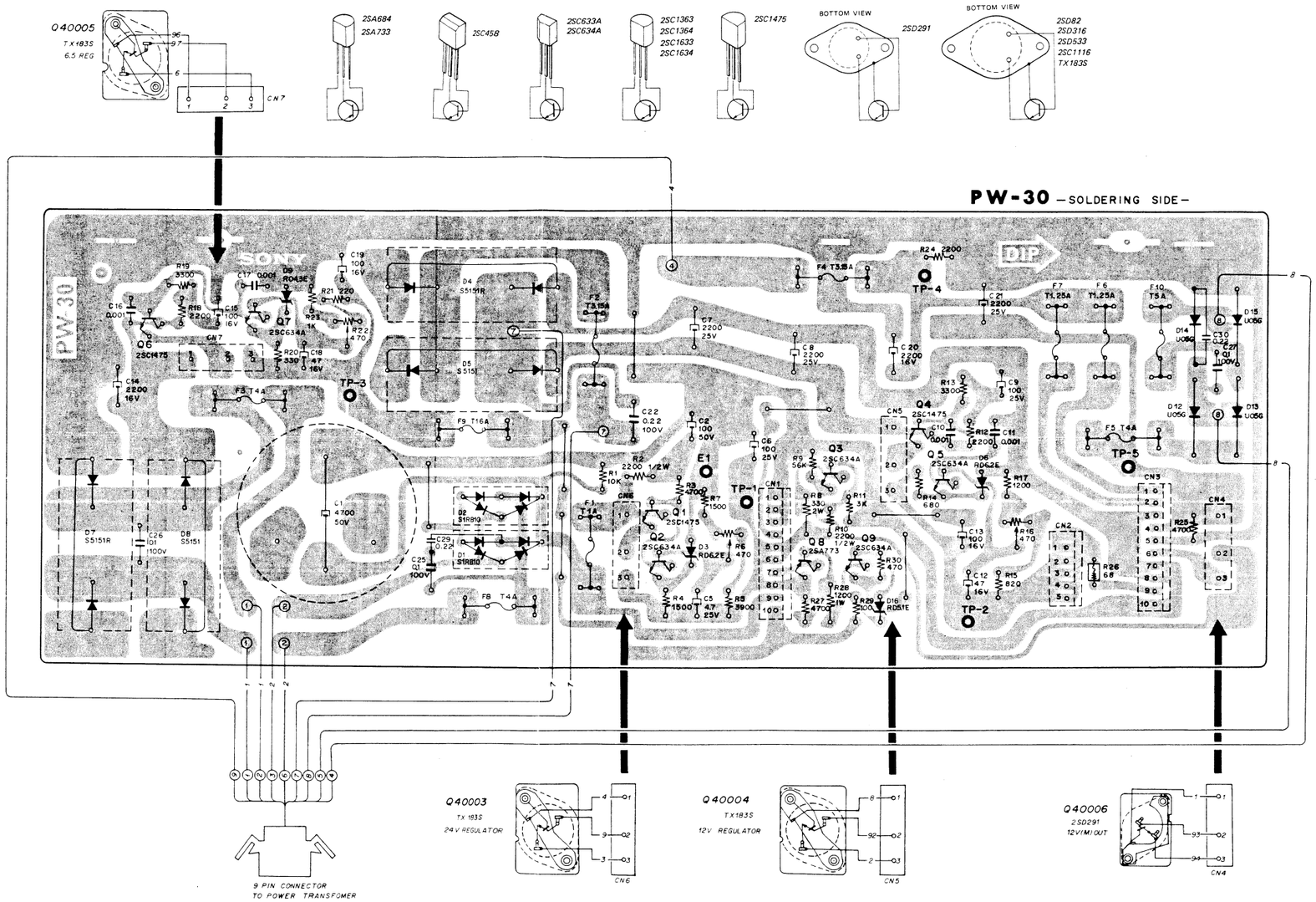


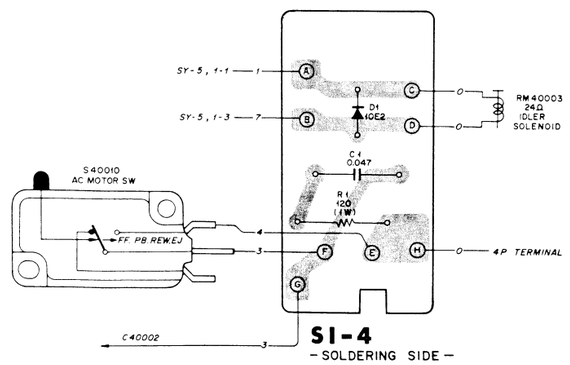
RL-5 - SOLDERING SIDE -

CN51	E-5	Q1	E-2	RV1	D-1
CN52	G-5	Q2	D-1	RV2	E-1
CN53	D-4	Q3	C-1	RV4	C-1
CN54	C-4	Q5	C-4	RV5	B-1
CN55	B-4	Q6	E-3	RV6	E-2
CN56	H-5	Q7	E-3	RV7	F-1
CN57	H-3	Q10	C-3	RV8	F-1
CN58	H-2	Q11	C-3	RV9	G-3
D1	B-2	Q12	C-3	RV601	G-5
D2	B-2	Q13	B-3	TP1	D-3
D3	G-3	Q15	C-3	TP2	D-4
D5	E-3	Q16	B-3	TP3	D-2
D9	G-2	Q17	B-5	TP4	C-4
D10	D-4	Q18	A-5	TP5	C-1
D11	A-3	Q20	D-4	TP6	B-2
D501	H-2	Q21	F-1	TP7	F-2
D601	H-5	Q22	E-4	TP8	D-3
D602	H-4	Q25	G-3	TP9	D-2
D603	H-3	Q26	G-2	TP14	F-3
D604	H-5	Q27	G-2	TP15	B-3
E1	G-5	Q28	D-5	TP16	B-4
E2	A-5	Q29	G-3	TP17	A-2
E3	A-2	Q30	A-4	TP18	A-3
E601	H-5	Q501	H-2	TP19	C-2
IC1	E-2	Q502	H-3	TP20	A-3
IC2	B-2	Q601	H-3	TP601	H-4
IC3	F-4			TP602	G-3
IC4	B-4			TP603	H-4
IC5	A-4			TP604	H-3
IC601	H-4				

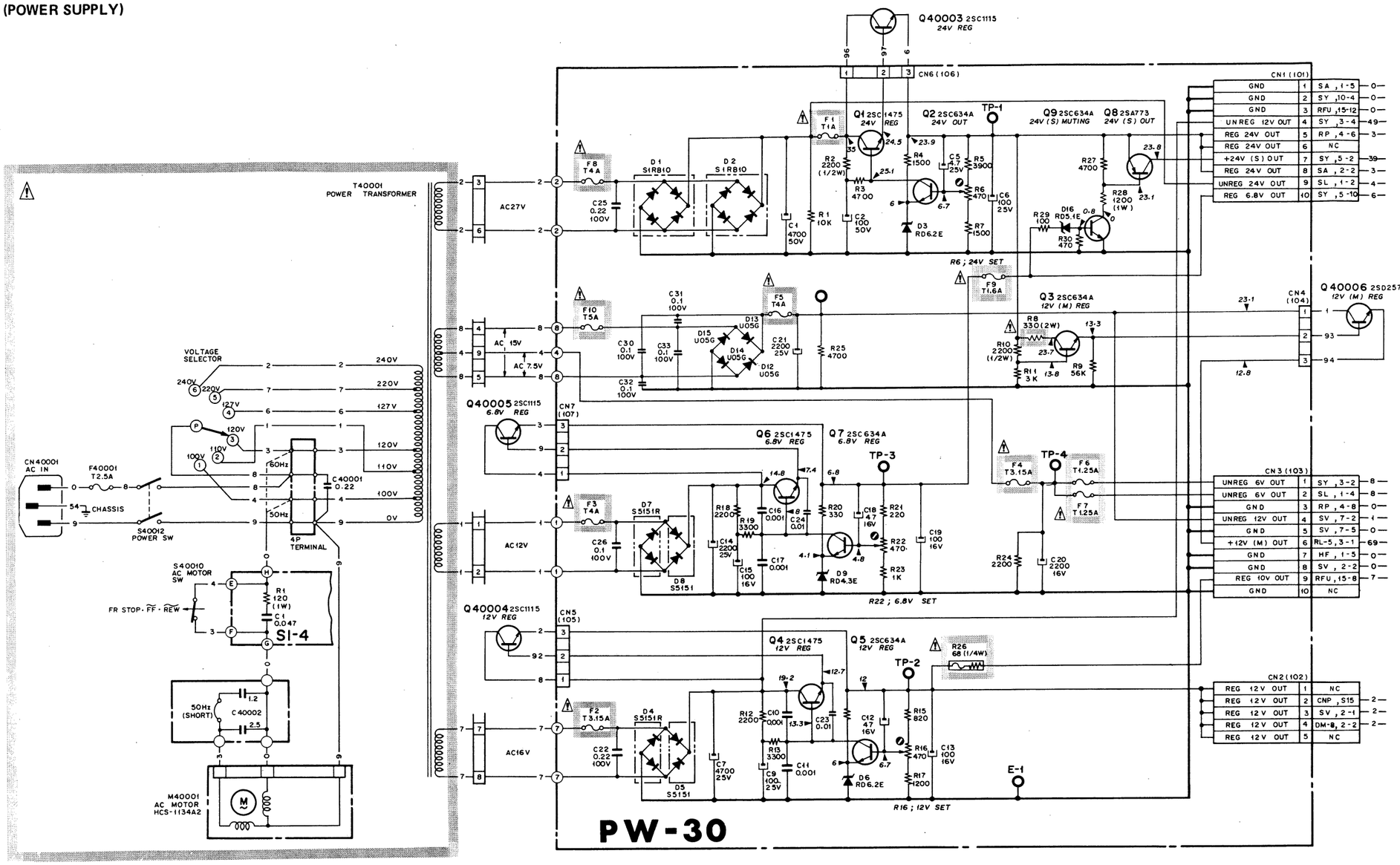


PW-30 (POWER SUPPLY)
SI-4 (AC MOTOR SW/IDLER SOL.)



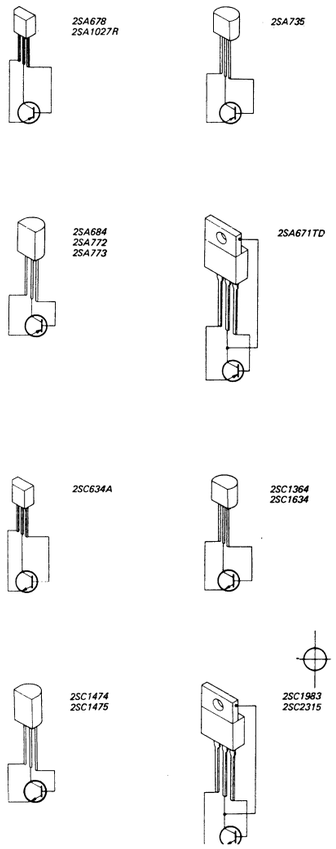


PW-30 (POWER SUPPLY)

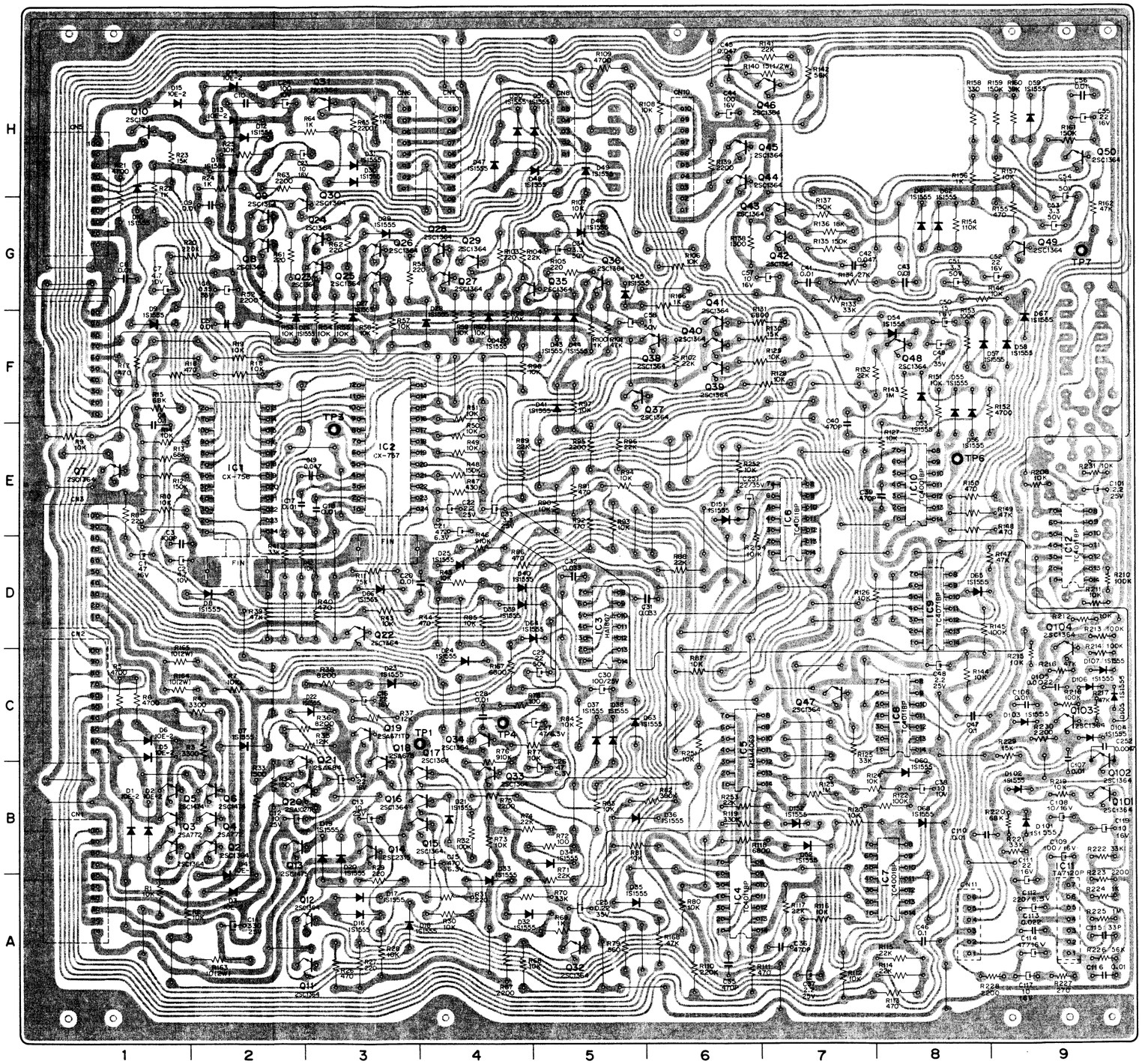


The shaded and ⚠ -marked components are critical to safety.
Replace only with same component as specified.

SY-46 (SYSTEM CONTROL)

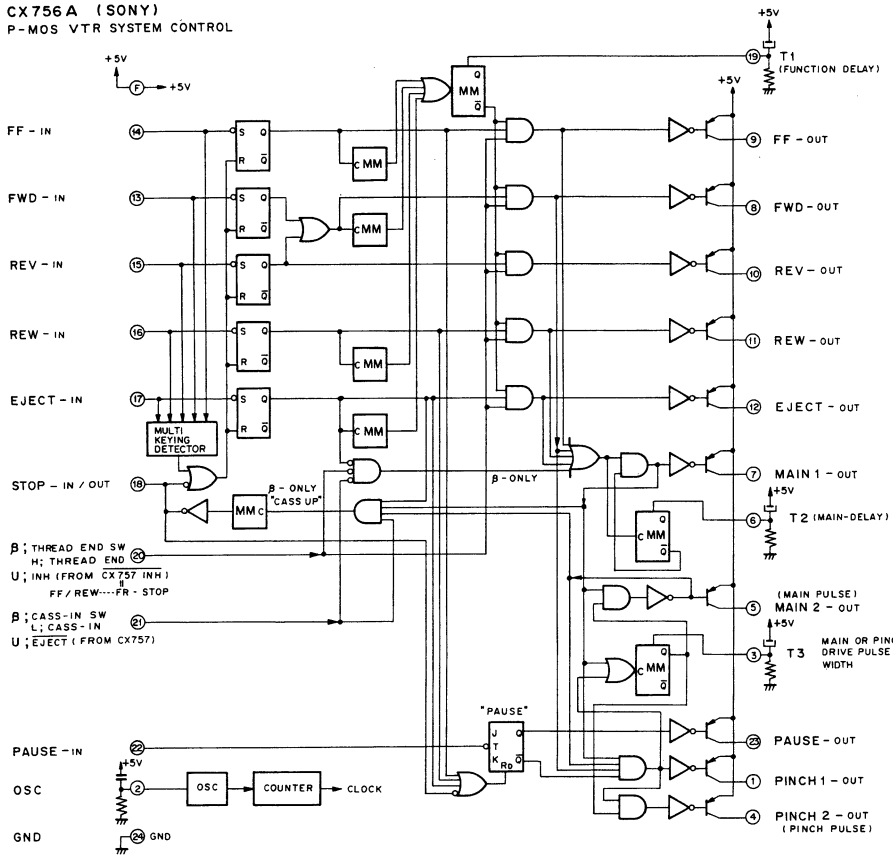


CN1	B-1	D25	D-4	D58	F-9	Q1	B-1	Q32	A-5
CN2	C-1	D26	F-2	D59	H-9	Q2	B-2	Q33	B-4
CN3	D-1	D27	F-3	D60	B-8	Q3	B-1	Q34	C-4
CN4	F-1	D28	F-4	D61	G-8	Q4	B-2	Q35	G-4
CN5	H-1	D29	G-3	D62	G-8	Q5	B-1	Q36	G-5
CN6	H-3	D30	H-3	D63	C-5	Q6	B-2	Q37	F-5
CN7	H-4	D31	H-3	D64	C-4	Q7	E-1	Q38	F-6
CN8	H-5	D32	A-4	D65	D-8	Q8	G-2	Q39	F-6
CN10	H-6	D33	A-4	D66	D-3	Q9	G-2	Q40	F-6
CN11	A-8	D34	B-5	D67	F-9	Q10	H-1	Q41	F-6
		D35	A-5	D68	B-8	Q11	A-3	Q42	G-7
D1	B-1	D36	B-5	D101	B-9	Q12	A-3	Q43	G-7
D2	B-1	D37	C-5	D102	B-9	Q13	B-2	Q44	H-6
D3	A-2	D38	C-5	D103	C-9	Q14	B-3	Q45	H-6
D4	A-2	D39	D-4	D104	C-9	Q15	B-4	Q46	H-7
D5	C-1	D40	D-4	D105	C-9	Q16	B-4	Q47	C-7
D6	C-1	D41	F-5	D106	C-9	Q17	B-4	Q48	F-8
D7	C-2	D42	F-4	D107	C-9	Q18	B-3	Q49	G-9
D8	D-2	D43	F-5	D151	E-6	Q19	C-3	Q50	H-9
D9	F-1	D44	F-5	D152	B-7	Q20	B-3	Q101	B-9
D10	G-1	D45	G-5			Q21	B-3	Q102	B-9
D11	H-2	D46	G-5	IC1	E-2	Q22	D-3	Q103	C-9
D12	H-2	D47	H-4	IC2	E-3	Q23	G-3	Q104	C-9
D13	H-2	D48	H-4	IC3	D-5	Q24	G-3		
D14	H-2	D49	H-5	IC4	A-6	Q25	G-3	TP1	C-3
D15	H-1	D50	H-4	IC5	B-6	Q26	G-3	TP3	E-3
D16	A-3	D51	H-5	IC6	D-7	Q27	G-4	TP4	C-4
D17	A-3	D52	B-7	IC7	A-8	Q28	G-4	TP6	E-8
D18	A-3	D53	F-8	IC8	C-8	Q29	G-4	TP7	G-9
D19	B-3	D54	F-7	IC9	D-8	Q30	G-2		
D20	B-3	D55	E-8	IC10	E-8	Q31	H-3		
D21	B-4	D56	E-8	IC11	A-9				
D22	C-2	D57	F-8	IC12	D-9				
D23	C-3								
D24	C-4								

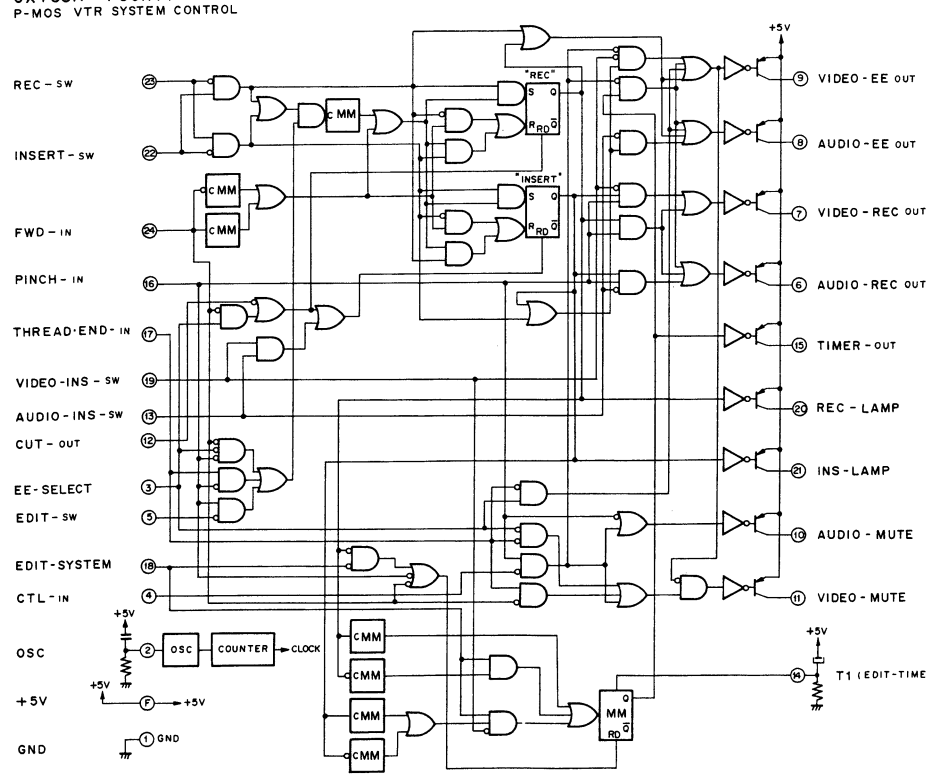


SY-46 (SYSTEM CONTROL)

CX756A (SONY)
P-MOS VTR SYSTEM CONTROL

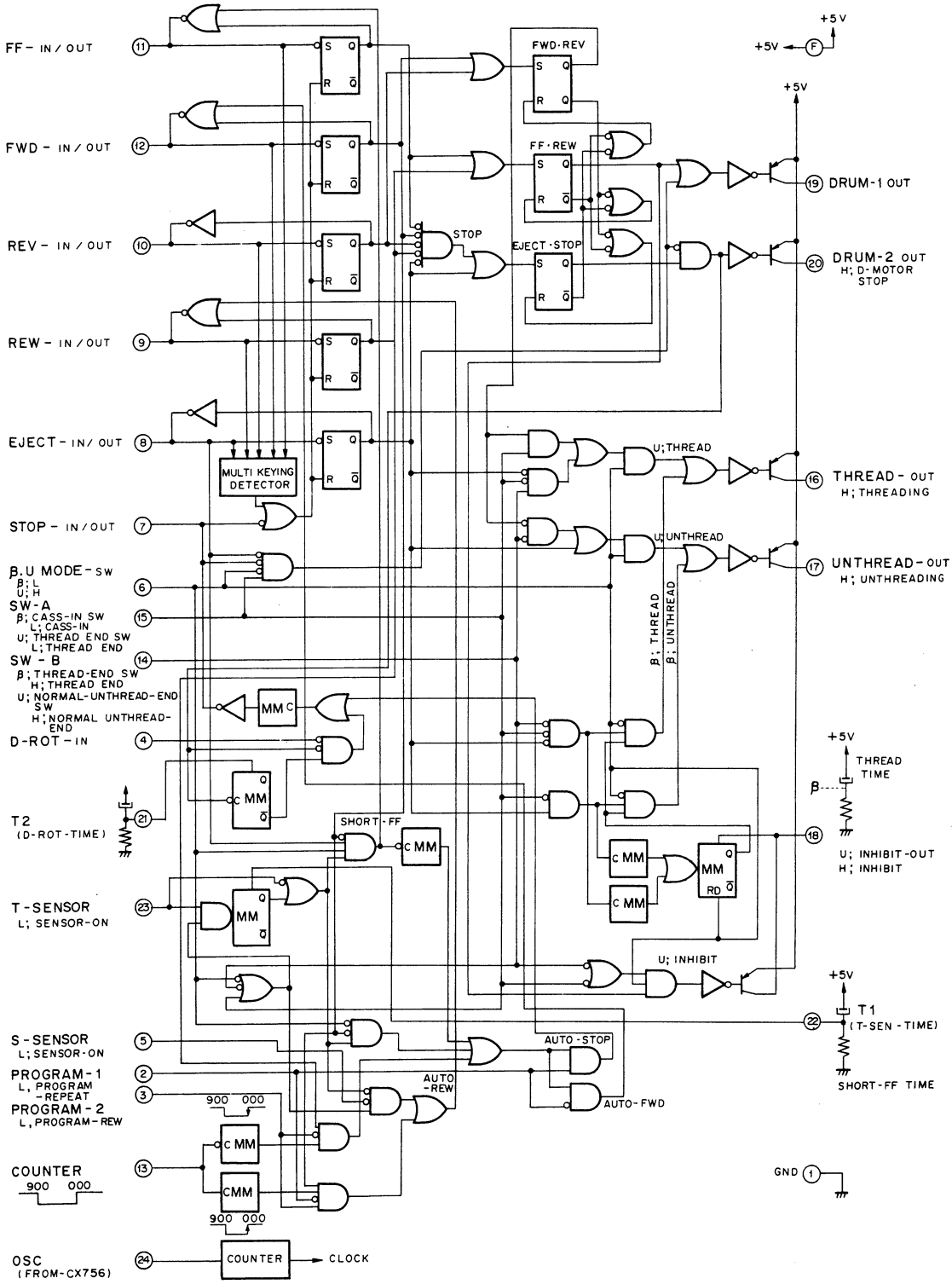


CX758A (SONY)
P-MOS VTR SYSTEM CONTROL

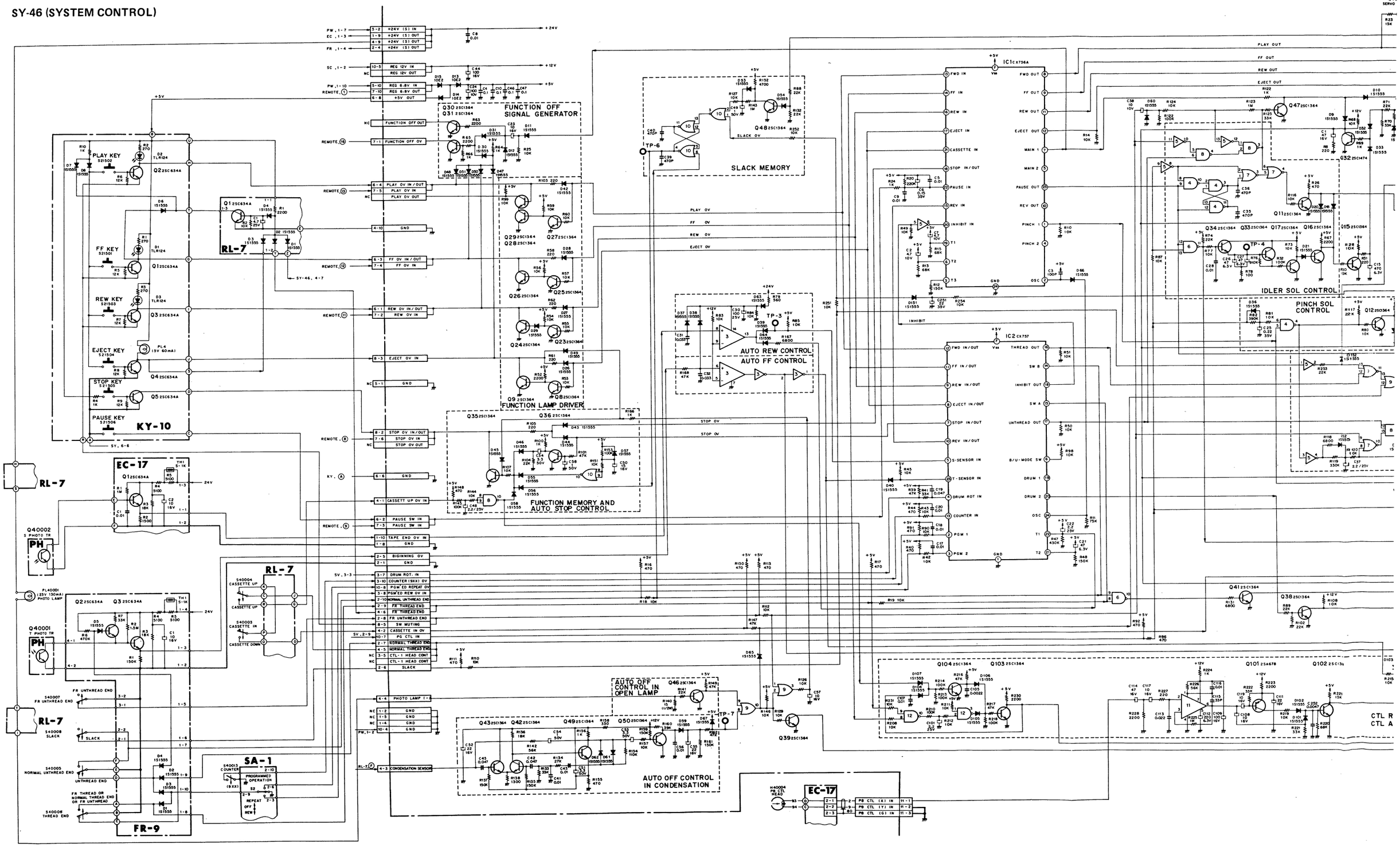


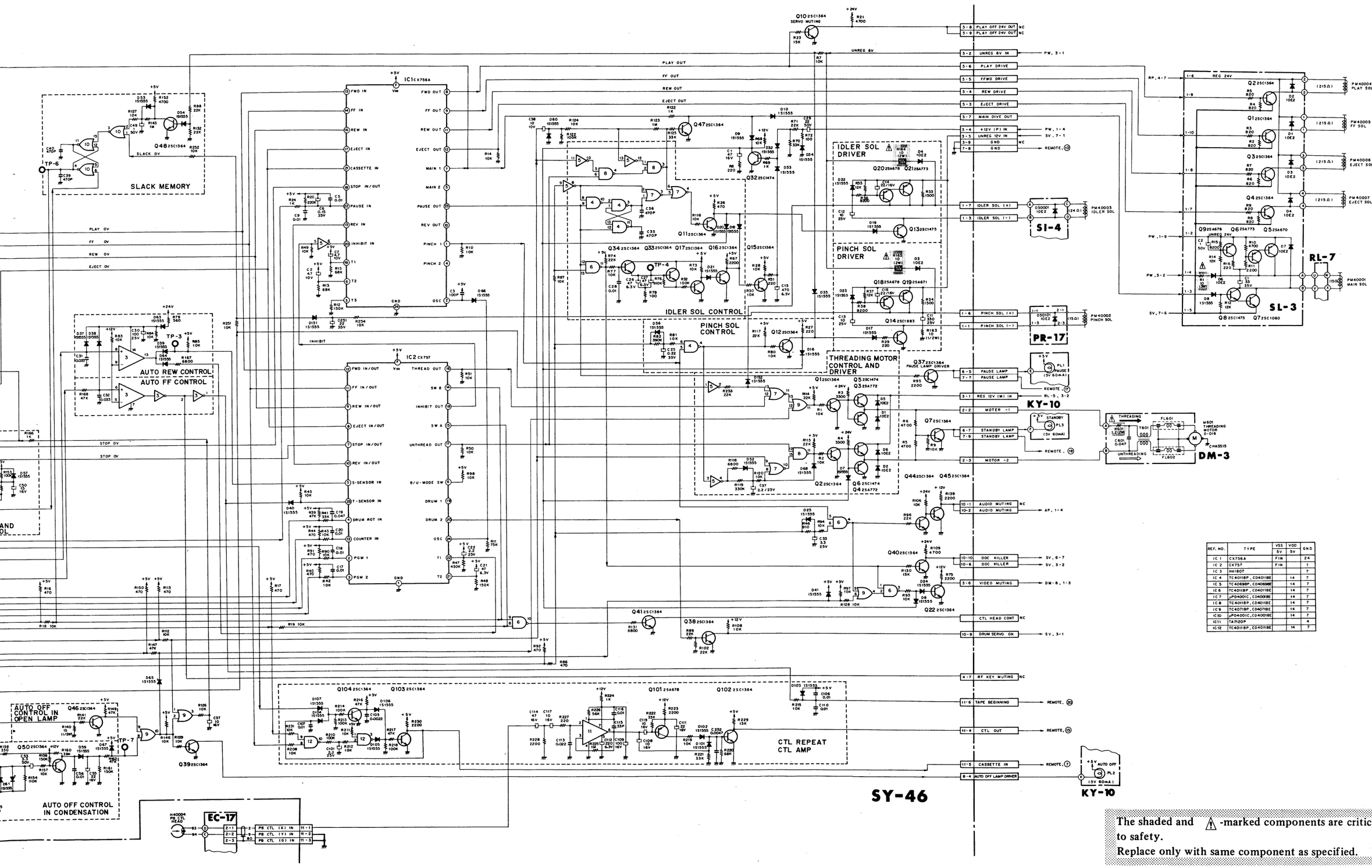
SY-46 (SYSTEM CONTROL)

CX757 (SONY)
P-MOS VTR SYSTEM CONTROL



SY-46 (SYSTEM CONTROL)



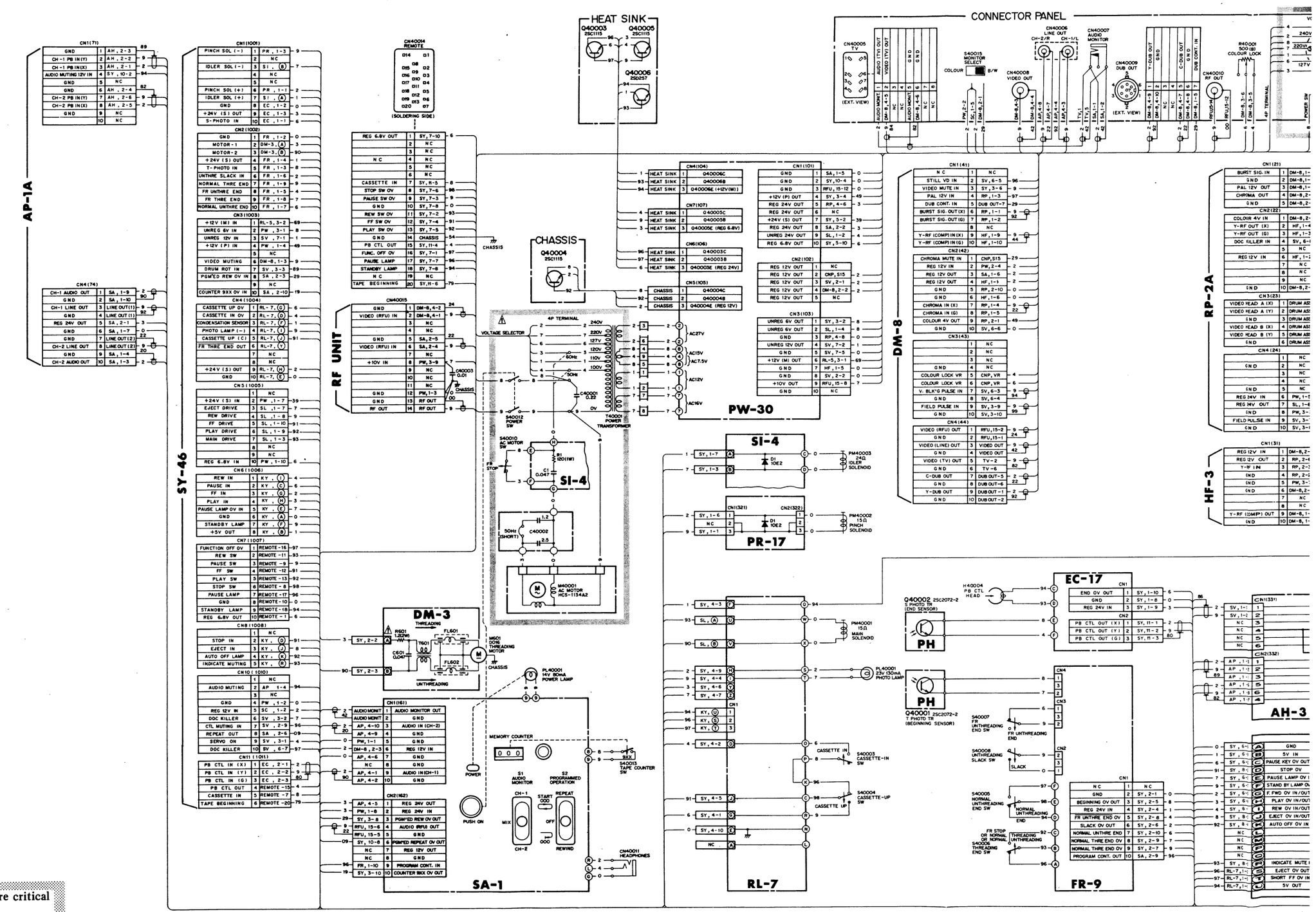


REF. NO.	TYPE	VSS 5V	VDD 5V	GND
IC 1	CX756A	FIN		24
IC 2	CX757	FIN		1
IC 3	HA1607			7
IC 4	TC4011BP, C04011BE		14	7
IC 5	TC4049BP, C04049BE		16	8
IC 6	TC4011BP, C04011BE		14	7
IC 7	μPD4001C, C04001BE		14	7
IC 8	TC4011BP, C04011BE		14	7
IC 9	TC4071BP, C04071BE		14	7
IC 10	μPD4001C, C04001BE		14	7
IC 11	TA7120P			4
IC 12	TC4011BP, C04011BE		14	7

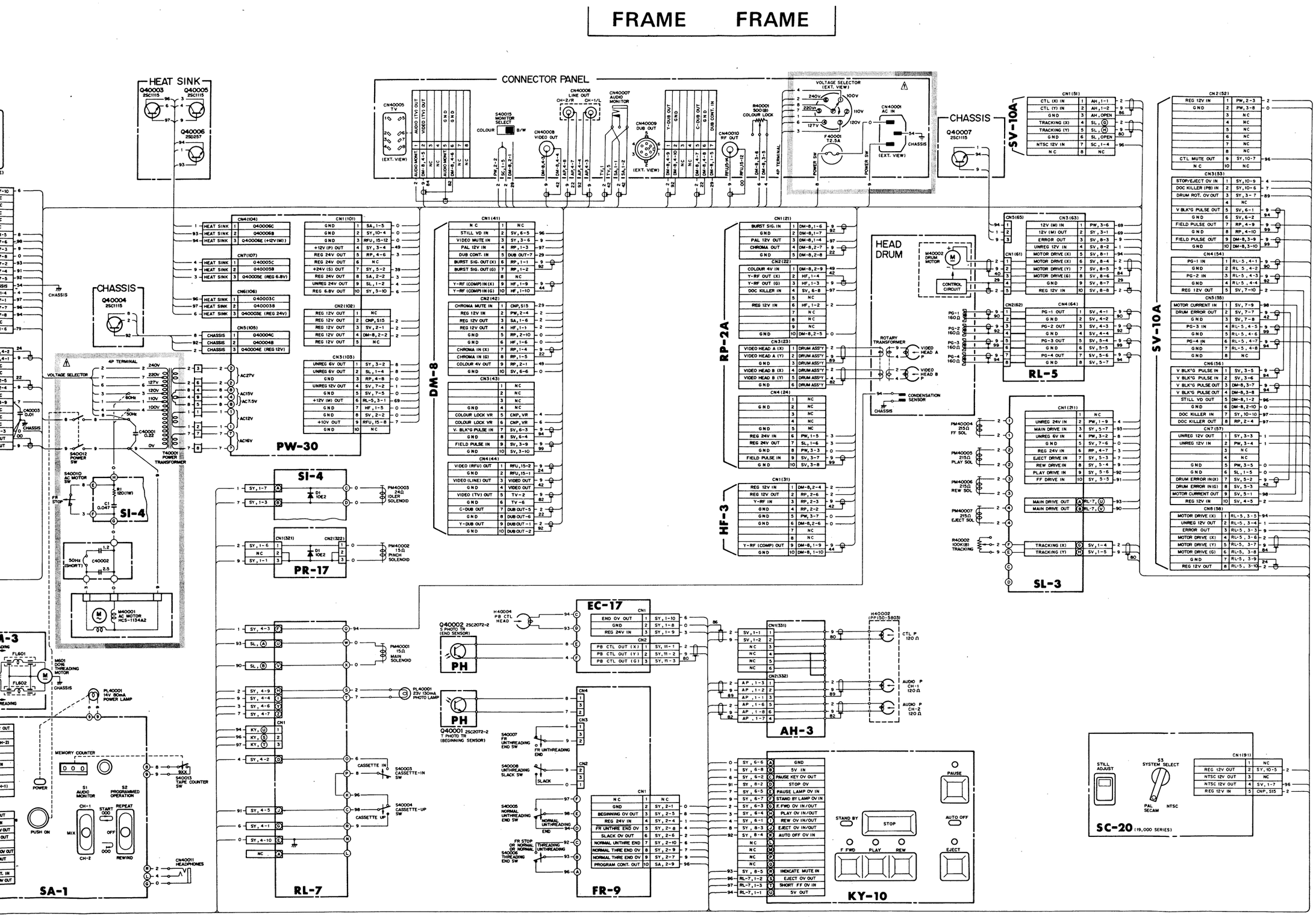
The shaded and ⚠-marked components are critical to safety.
Replace only with same component as specified.

FRAME FRAME

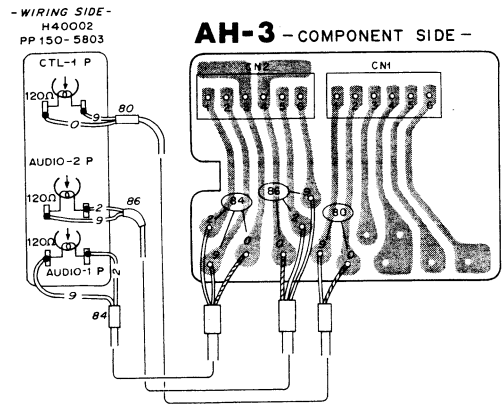
FRAME WIRING



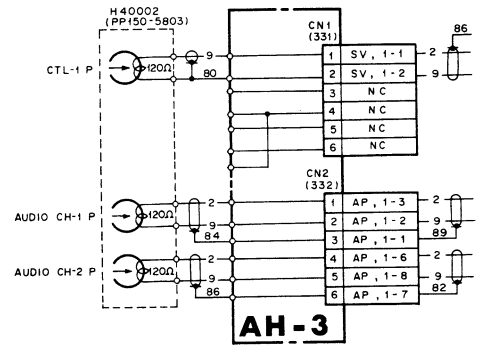
The shaded and ⚠ -marked components are critical to safety.
Replace only with same component as specified.

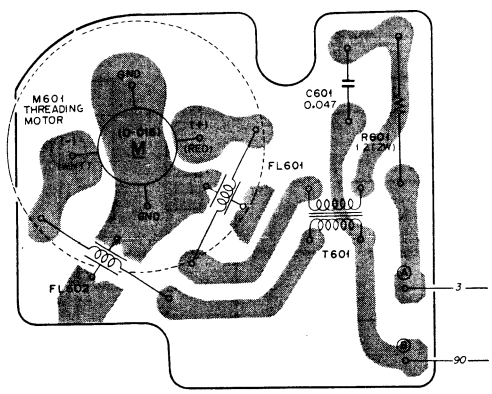

HEAT SINK
Q40003 2SC1115
Q40005 2SC1115
Q40006 2SD257
CONNECTOR PANEL
CN40005 TV
AUDIO (TV) OUT
VIDEO (TV) OUT
(EXT. VIEW)
S40015 MONITOR SELECT
COLOUR
B/W
CN40008 VIDEO OUT
CN40006 LINE OUT
CH-2/R
CH-1/L
CN40007 AUDIO MONITOR
CN40009 DUB OUT
Y-DUB OUT
C-DUB OUT
DUB CONT. IN
CN40010 RF OUT
R40001 500 Ω COLOUR LOCK
4P TERMINAL
VOLTAGE SELECTOR (EXT. VIEW)
240V
220V
127V
100V
110V
120V
F40001 T2.5A
CN40001 AC IN
CHASSIS
(EXT. VIEW)
POWER SW
CHASSIS
Q40007 2SC1115
SV-10A
CN1(51)
CTL (X) IN
CTL (Y) IN
GND
TRACKING (X)
TRACKING (Y)
GND
NTSC 12V IN
N C
CTL MUTE OUT
N C
CN2(52)
REG 12V IN
GND
CN3(53)
STOP/EJECT OV IN
DOC KILLER (PB) IN
DRUM ROT. OV OUT
V BLK'G PULSE OUT
GND
FIELD PULSE OUT
GND
CN4(54)
PG-1 IN
GND
PG-2 IN
GND
REG 12V OUT
CN5(55)
MOTOR CURRENT IN
DRUM ERROR OUT
GND
PG-3 IN
GND
PG-4 IN
GND
CN6(56)
V BLK'G PULSE IN
V BLK'G PULSE IN
V BLK'G PULSE OUT
V BLK'G PULSE OUT
STILL VD OUT
GND
DOC KILLER IN
DOC KILLER OUT
CN7(57)
UNREG 12V OUT
UNREG 12V IN
GND
GND
DRUM ERROR IN(X)
DRUM ERROR IN(G)
MOTOR CURRENT OUT
REG 12V IN
CN8(58)
MOTOR DRIVE (X)
UNREG 12V OUT
ERROR OUT
MOTOR DRIVE (X)
MOTOR DRIVE (Y)
MOTOR DRIVE (G)
GND
REG 12V OUT
CN4(104)
HEAT SINK 0400006C
HEAT SINK 0400006B
HEAT SINK 0400006E (+42V(M))
CN7(107)
HEAT SINK 0400005C
HEAT SINK 0400005B
HEAT SINK 0400005E (REG 6.8V)
CN6(106)
HEAT SINK 0400003C
HEAT SINK 0400003B
HEAT SINK 0400003E (REG 24V)
CN5(105)
CHASSIS 0400004C
CHASSIS 0400004B
CHASSIS 0400004E (REG 12V)
CN1(101)
GND
GND
+12V (P) OUT
REG 24V OUT
+24V (S) OUT
REG 24V OUT
UNREG 24V OUT
REG 6.8V OUT
CN2(102)
REG 12V OUT
REG 12V OUT
REG 12V OUT
REG 12V OUT
CN3(103)
UNREG 6V OUT
UNREG 6V OUT
GND
UNREG 12V OUT
GND
+12V (M) OUT
GND
GND
+10V OUT
GND
CHASSIS
Q40004 2SC1115
4P TERMINAL
VOLTAGE SELECTOR
240V
220V
127V
120V
110V
100V
50Hz
60Hz
0V
AC27V
AC15V
AC7.5V
AC12V
AC16V
PW-30
C40003 0.01
C40001 0.22
S40012 POWER SW
T40001 POWER TRANSFORMER
S40010 AC MOTOR SW
FF STOP
R1 120(1W)
C1 0.047
SI-4
50Hz (SHORT)
C40002
M40001 AC MOTOR HCS-1134A2
FL601
FL602
M601 DOR THREADING MOTOR
CHASSIS
PL40001 14V 80mA POWER LAMP
MEMORY COUNTER
POWER
PUSH ON
S1 AUDIO MONITOR
CH-1
MIX
CH-2
S2 PROGRAMMED OPERATION
START 000
REPEAT
OFF
000
REWIND
S40013 TAPE COUNTER SW
CN40001 HEADPHONES
SA-1
SI-4
SY,1-7
SY,1-3
D1 10E2
PM40003 24Ω IDLER SOLENOID
PR-17
SY,1-6
NC
SY,1-1
CN1(321)
CN2(322)
D1 10E2
PM40002 15Ω PINCH SOLENOID
DM-8
CN1(41)
N C
STILL VD IN
VIDEO MUTE IN
PAL 12V IN
DUB CONT. IN
BURST SIG. OUT (X)
BURST SIG. OUT (G)
Y-RF (COMP) IN (X)
Y-RF (COMP) IN (G)
CN2(42)
CHROMA MUTE IN
REG 12V IN
REG 12V OUT
REG 12V OUT
GND
GND
CHROMA IN (X)
CHROMA IN (G)
COLOUR 4V OUT
GND
CN3(43)
GND
GND
COLOUR LOCK VR
COLOUR LOCK VR
V. BLK'G PULSE IN
GND
FIELD PULSE IN
GND
CN4(44)
VIDEO (RFU) OUT
GND
VIDEO (LINE) OUT
GND
VIDEO (TV) OUT
GND
C-DUB OUT
GND
Y-DUB OUT
GND
RP-2A
CN1(21)
BURST SIG. IN
GND
PAL 12V OUT
CHROMA OUT
GND
CN2(22)
COLOUR 4V IN
Y-RF OUT (X)
Y-RF OUT (G)
DOC KILLER IN
REG 12V IN
GND
CN3(23)
VIDEO HEAD A (X)
VIDEO HEAD A (Y)
GND
VIDEO HEAD B (X)
VIDEO HEAD B (Y)
GND
CN4(24)
GND
GND
GND
REG 24V IN
REG 24V OUT
GND
FIELD PULSE IN
GND
HF-3
CN1(31)
REG 12V IN
REG 12V OUT
Y-RF IN
GND
GND
GND
Y-RF (COMP) OUT
GND
HEAD DRUM
M40002 DRUM MOTOR
CONTROL CIRCUIT
ROTARY TRANSFORMER
VIDEO HEAD A P
VIDEO HEAD B P
CONDENSATION SENSOR
CHASSIS
CN5(65)
CN1(61)
CN2(62)
CN3(63)
12V (M) IN
12V (M) OUT
ERROR OUT
UNREG 12V IN
MOTOR DRIVE (X)
MOTOR DRIVE (Y)
MOTOR DRIVE (G)
GND
REG 12V IN
CN4(64)
PG-1 OUT
GND
PG-2 OUT
GND
PG-3 OUT
GND
PG-4 OUT
GND
RL-5
PG-1 160Ω
PG-2 160Ω
PG-3 160Ω
PG-4 160Ω
CN1(211)
UNREG 24V IN
MAIN DRIVE IN
UNREG 6V IN
GND
REG 24V IN
EJECT DRIVE IN
REW DRIVE IN
PLAY DRIVE IN
FF DRIVE IN
MAIN DRIVE OUT
MAIN DRIVE OUT
SL-3
PM40004 21Ω FF SOL
PM40005 21Ω PLAY SOL
PM40006 21Ω REW SOL
PM40007 21Ω EJECT SOL
R40002 100K(B) TRACKING
TRACKING (X)
TRACKING (Y)
EC-17
CN1
END OV OUT
GND
REG 24V IN
CN2
PB CTL OUT (X)
PB CTL OUT (Y)
PB CTL OUT (G)
Q40002 2SC2072-2 T PHOTO TR (END SENSOR)
PH
Q40001 2SC2072-2 T PHOTO TR (BEGINNING SENSOR)
PH
H40004 PB CTL HEAD
RL-7
SY,4-3
SL,A
SL,B
SY,4-9
SY,4-4
SY,4-6
SY,4-7
KY,U
KY,S
KY,T
SY,4-2
SY,4-5
SY,4-1
SY,4-10
NC
PM40001 15Ω MAIN SOLENOID
PL40001 23V 130mA PHOTO LAMP
CASSETTE IN
CASSETTE UP
S40003 CASSETTE-IN SW
S40004 CASSETTE-UP SW
S40007 FR UNTHREADING END SW
S40008 UNTHREADING SLACK SW
S40005 NORMAL UNTHREADING END SW
S40006 FR STOP OR NORMAL THREADING END SW
FR UNTHREADING END
SLACK
NORMAL UNTHREADING END
THREADING UNTHREADING
FR-9
N C
GND
BEGINNING OV OUT
REG 24V IN
FR UNTHRE END OV
SLACK OV OUT
NORMAL UNTHRE END
NORMAL THRE END OV
NORMAL THRE END OV
PROGRAM CONT. OUT
AH-3
H40002 (PP150-5803)
CN1(331)
CN2(332)
CTL P 120Ω
AUDIO P CH-1 120Ω
AUDIO P CH-2 120Ω
KY-10
STAND BY
STOP
PAUSE
AUTO OFF
F FWD
PLAY
REW
EJECT
GND
5V IN
PAUSE KEY OV OUT
STOP OV
PAUSE LAMP OV IN
STAND BY LAMP OV IN
F.FWD OV IN/OUT
PLAY OV IN/OUT
REW OV IN/OUT
EJECT OV IN/OUT
AUTO OFF OV IN
INDICATE MUTE IN
EJECT OV OUT
SHORT FF OV IN
5V OUT
SC-20 (19,000 SERIES)
STILL ADJUST
S3 SYSTEM SELECT
PAL SECAM
NTSC
CN1(91)
REG 12V OUT
NTSC 12V OUT
NTSC 12V OUT
REG 12V IN

AH-3 (AUDIO/CTL HEAD)
DM-3 (THREADING MOTOR)

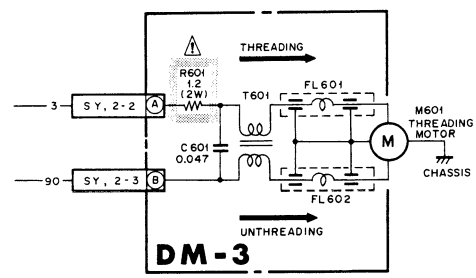


AH-3 – COMPONENT SIDE –



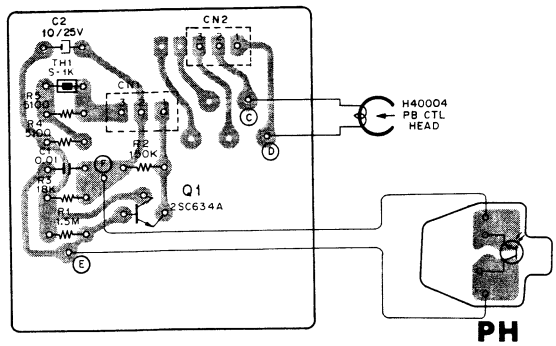


DM-3 – SOLDERING SIDE –

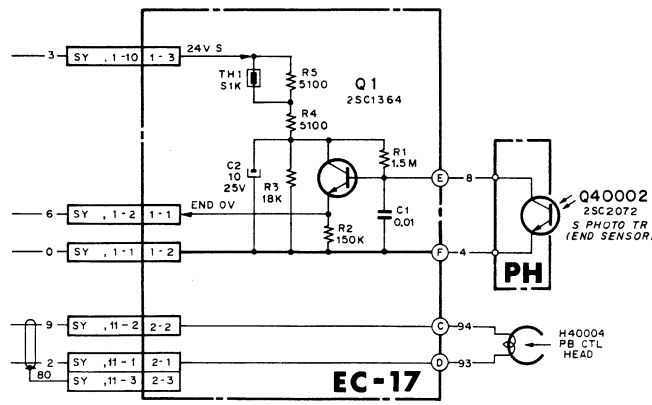


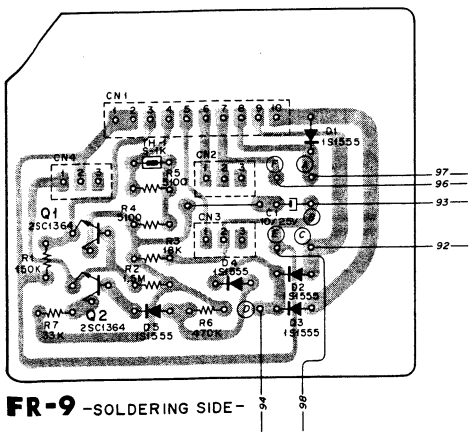
The shaded and ⚠ -marked components are critical to safety.
Replace only with same component as specified.

EC-
FR-9

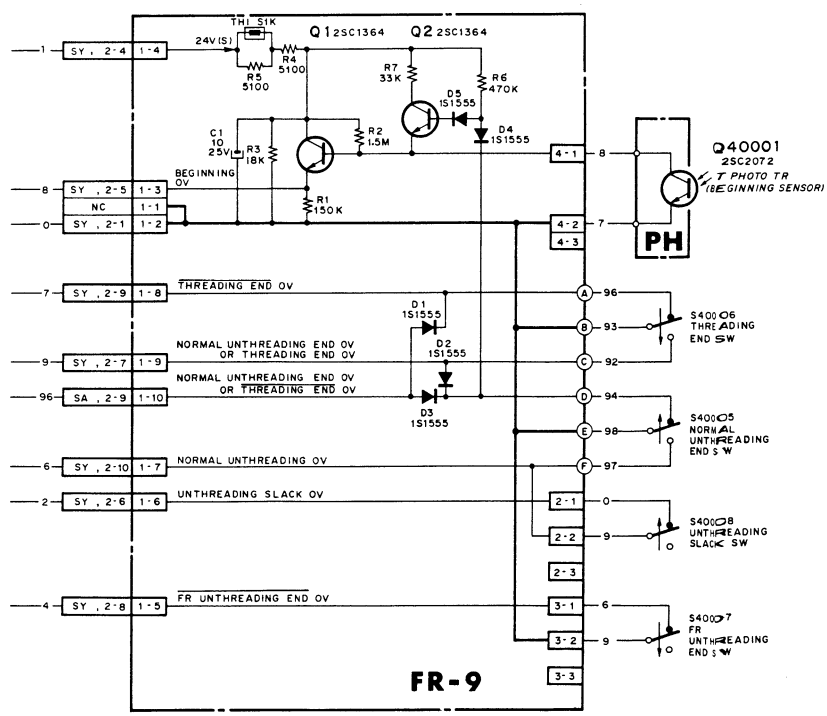


EC-17 -SOLDERING SIDE-

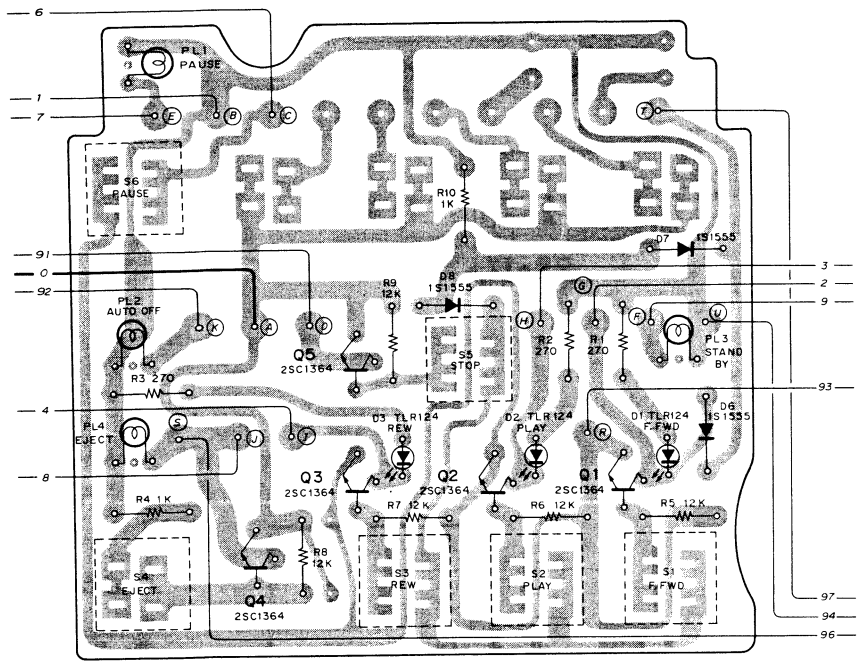




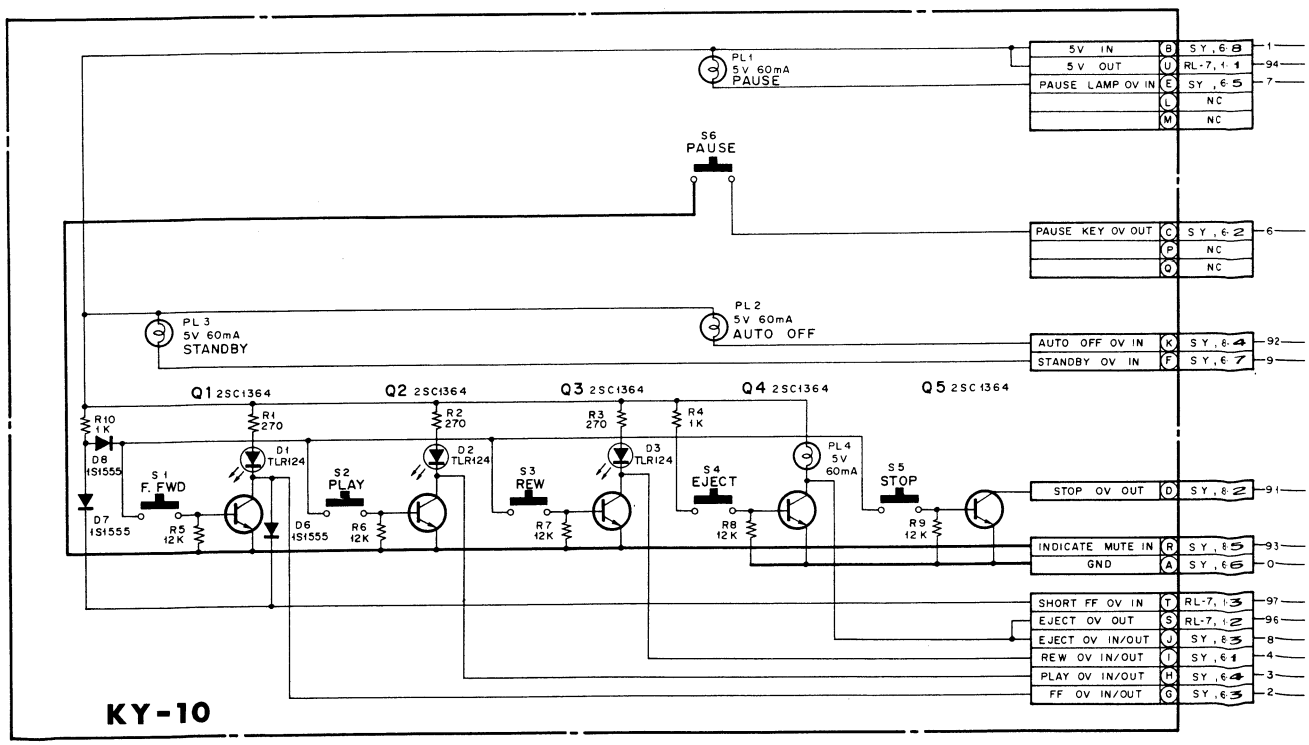
FR-9 -SOLDERING SIDE-



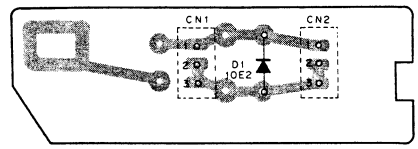
KY-10 (KEY BOARD)



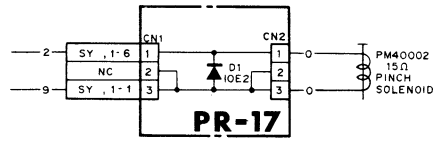
KY-10 -SOLDERING SIDE-

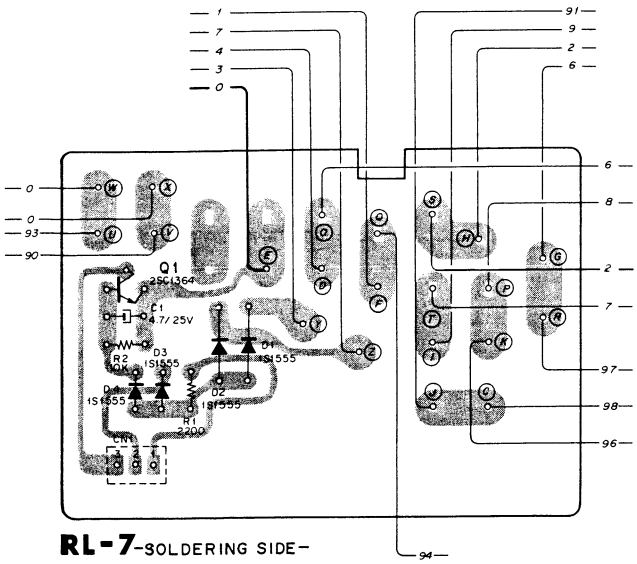


PR-17
RL-7

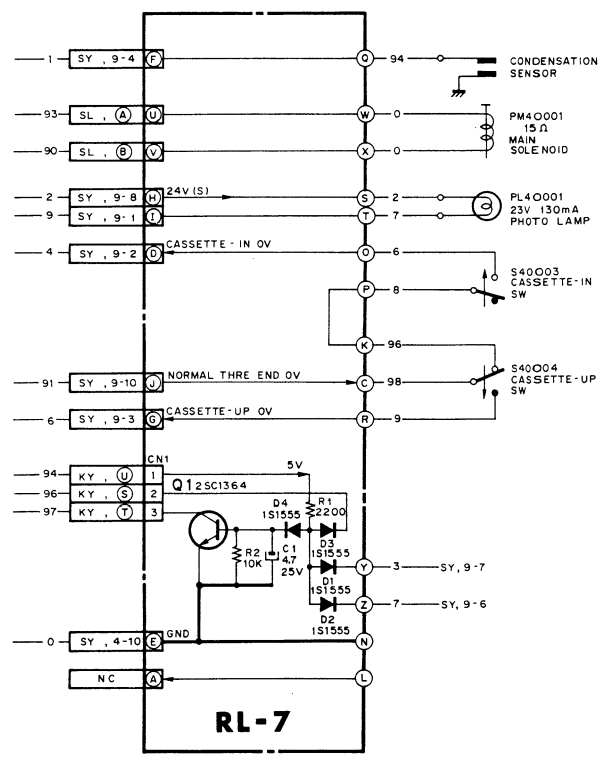


PR-17-SOLDERING SIDE-

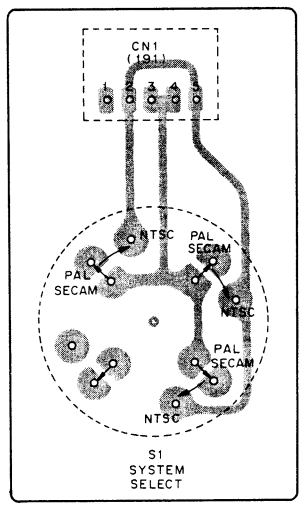




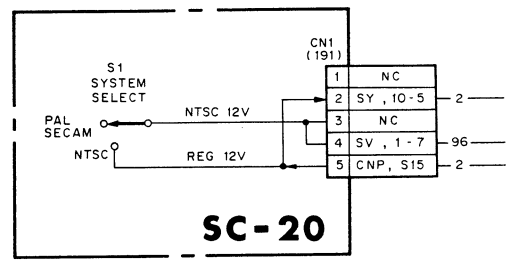
RL-7-SOLDERING SIDE-



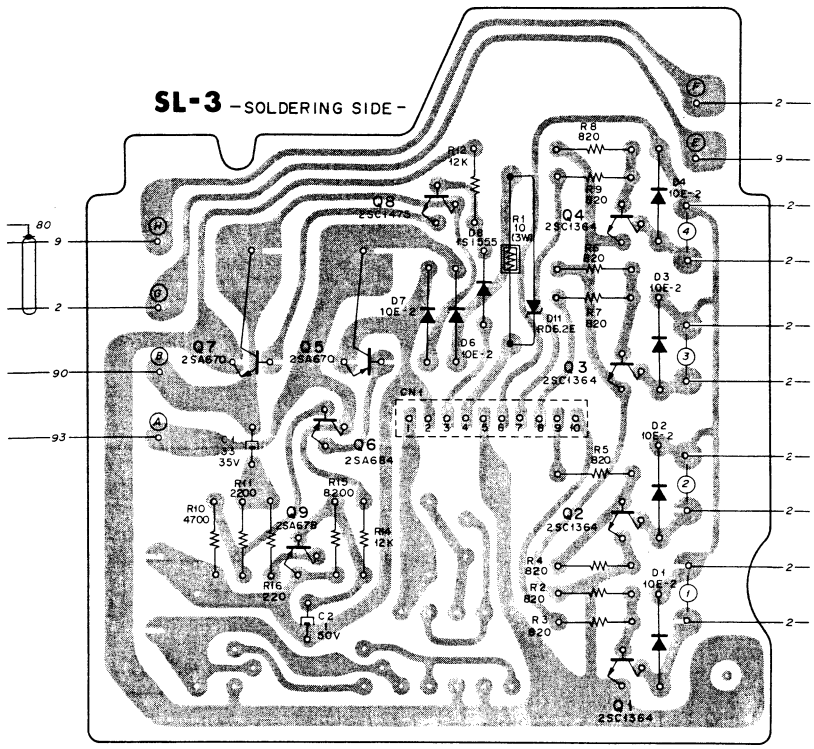
SC-20

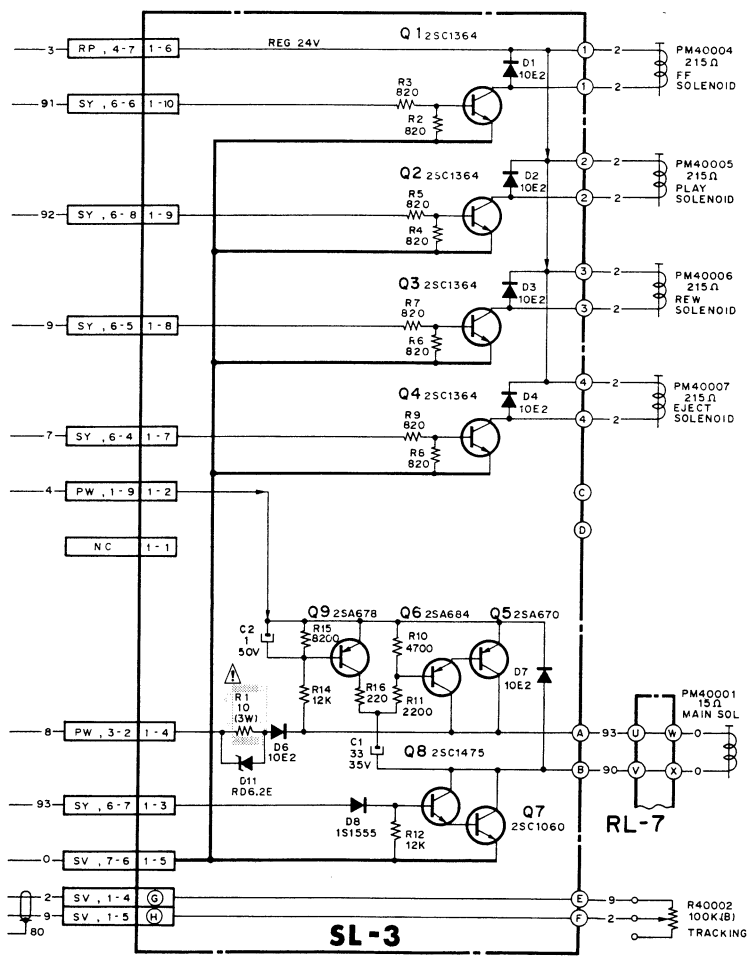


SC-20
- SOLDERING SIDE -



SL-3





The shaded and ⚠ -marked components are critical to safety.
Replace only with same component as specified.

SECTION 13
SPARE PARTS AND JIG

13-1. PARTS INFORMATION

1. **Safety Related Component Warning**

   Components identified by shading marked with ⚠ on the schematic diagrams, exploded views and electrical spare parts list are critical to safe operation. Replace these components with Sony parts whose parts numbers appear as shown in this manual or in service bulletins and service manual supplements published by Sony.

2. Replacement Parts supplied from Sony Parts Center will sometimes have different shape and outside view from the parts which actually in use. This is due to "accommodating the improved parts and/or engineering changes" or "standardization of genuine parts."
   - This manul's exploded views and electrical spare parts lists are indicating the parts numbers of "the standardized genuine parts at present".
   - Regarding engineering parts changes in our engineering dapartment, refer Sony service bulletins and service manual supplements.

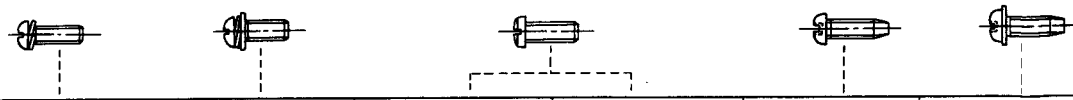
3. **Printed Components in Bold-Face type** on the exploded views and electrical spare parts list are normally stocked for replacement purposes. The remaining parts are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.

4. Item with no part number and/or no description are not stocked because they are seldom required for routine service.

5. (T) after a spring description is shown on the exploded views in order to indicate the number of a spring turn required for the use.

   (Example) Spring, tension (24T); This spring must be cut at its 24th turn for actual use.

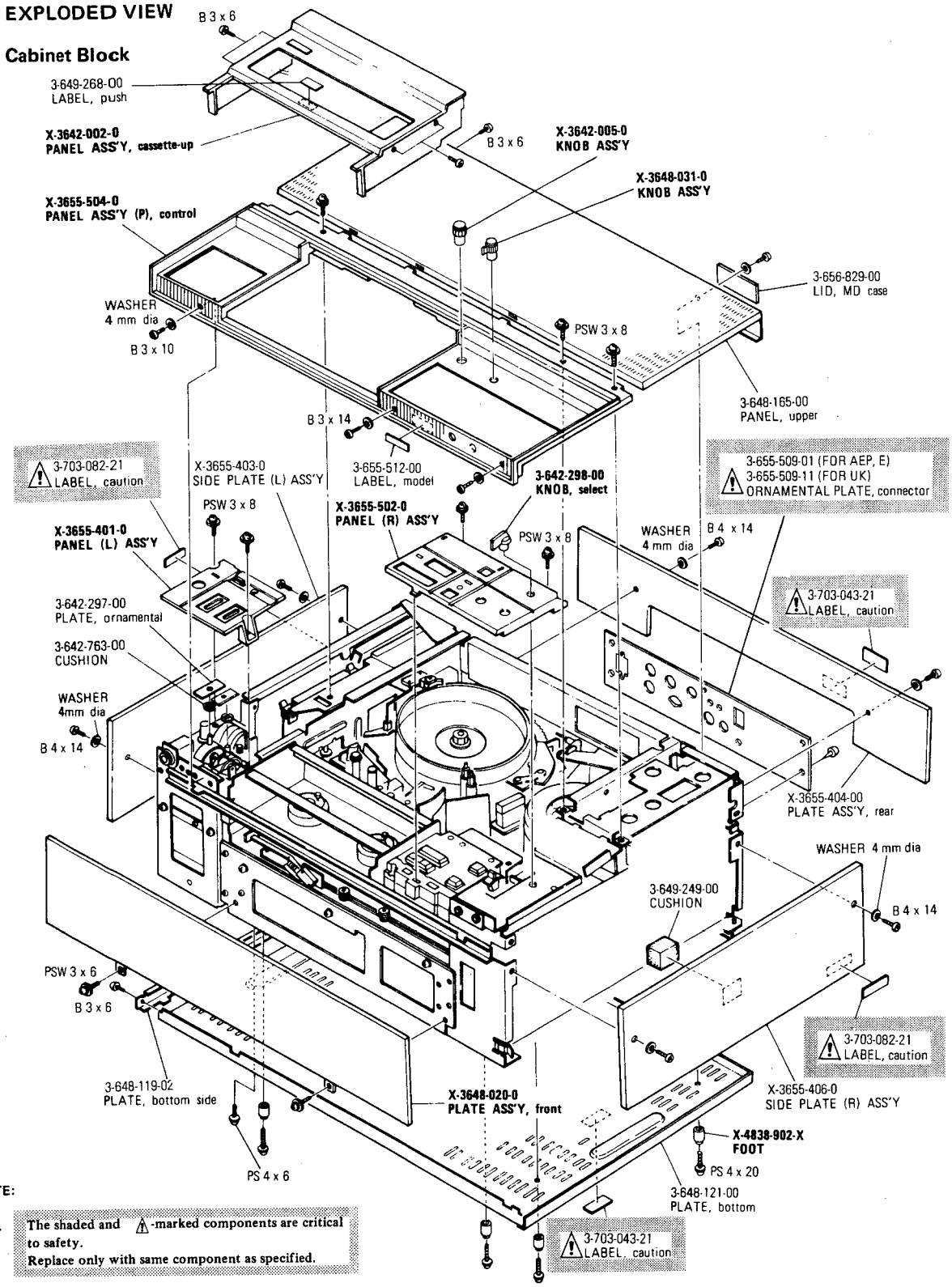
6. Screws
   - All the screws used in this machine are the TOTSU type unless otherwise noted. The screws are interchangeable with the Phillips type (⊕) and slotted type (⊖) screws.
   - Please order as the following part number when ordering the TOTSU type screws.



Size	PS	PSW	B (BZnN)	B (Cr-N)	PTT	PTTWH
2.6 x 4	7-621-972-05	———	7-621-912-10	7-621-912-18	———	———
2.6 x 6	7-621-972-25	———	7-621-912-30	7-621-912-38	———	———
2.6 x 8	7-621-972-35	———	7-621-912-40	7-621-912-48	———	———
2.6 x 10	7-621-972-45	———	7-621-912-50	7-621-912-58	———	———
2.6 x 12	7-621-972-55	———	7-621-912-60	7-621-912-68	———	———
3 x 6	7-686-447-01	7-686-527-01	7-686-624-09	7-686-624-04	7-687-411-31	7-687-510-31
3 x 8	7-686-448-01	7-686-528-01	7-686-625-09	7-686-625-04	7-687-412-31	7-687-511-31
3 x 10	7-686-449-01	7-686-529-01	7-686-626-09	7-686-626-04	7-687-413-31	7-687-512-31
3 x 12	7-686-450-01	7-686-530-01	7-686-627-09	7-686-627-04	———	———
3 x 16	7-686-452-01	7-686-532-01	7-686-629-09	7-686-629-04	———	———
3 x 25	7-686-454-01	7-686-534-01	7-686-631-09	7-686-631-04	———	———
4 x 8	7-686-468-01	———	———	7-686-635-04	———	———
4 x 12	7-686-470-01	———	———	7-686-637-04	———	———
4 x 14	7-686-471-01	———	———	7-686-638-04	———	———
4 x 16	7-686-472-01	———	———	7-686-639-04	———	———
4 x 20	7-686-473-01	———	———	7-686-640-04	———	———

13-2. EXPLODED VIEW

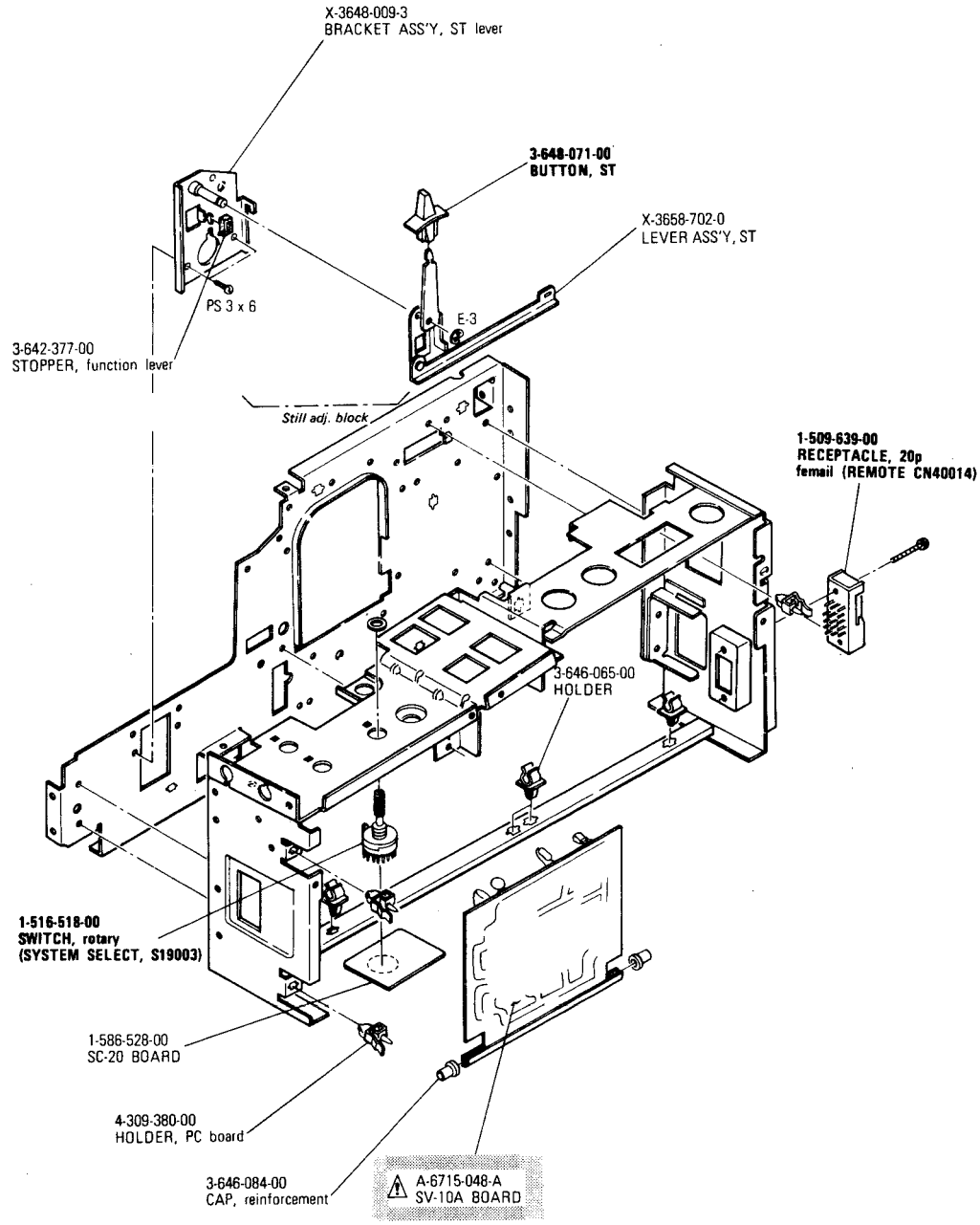
Cabinet Block



NOTE:

1. **The shaded and ⚠-marked components are critical to safety.**
   Replace only with same component as specified.
2. Parts printed in **Bold-Face type** are normally stocked for replacement purposes. The remaining parts shown in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.
3. Item with no part number and/or no description are not stocked because they are seldom required for routine service.

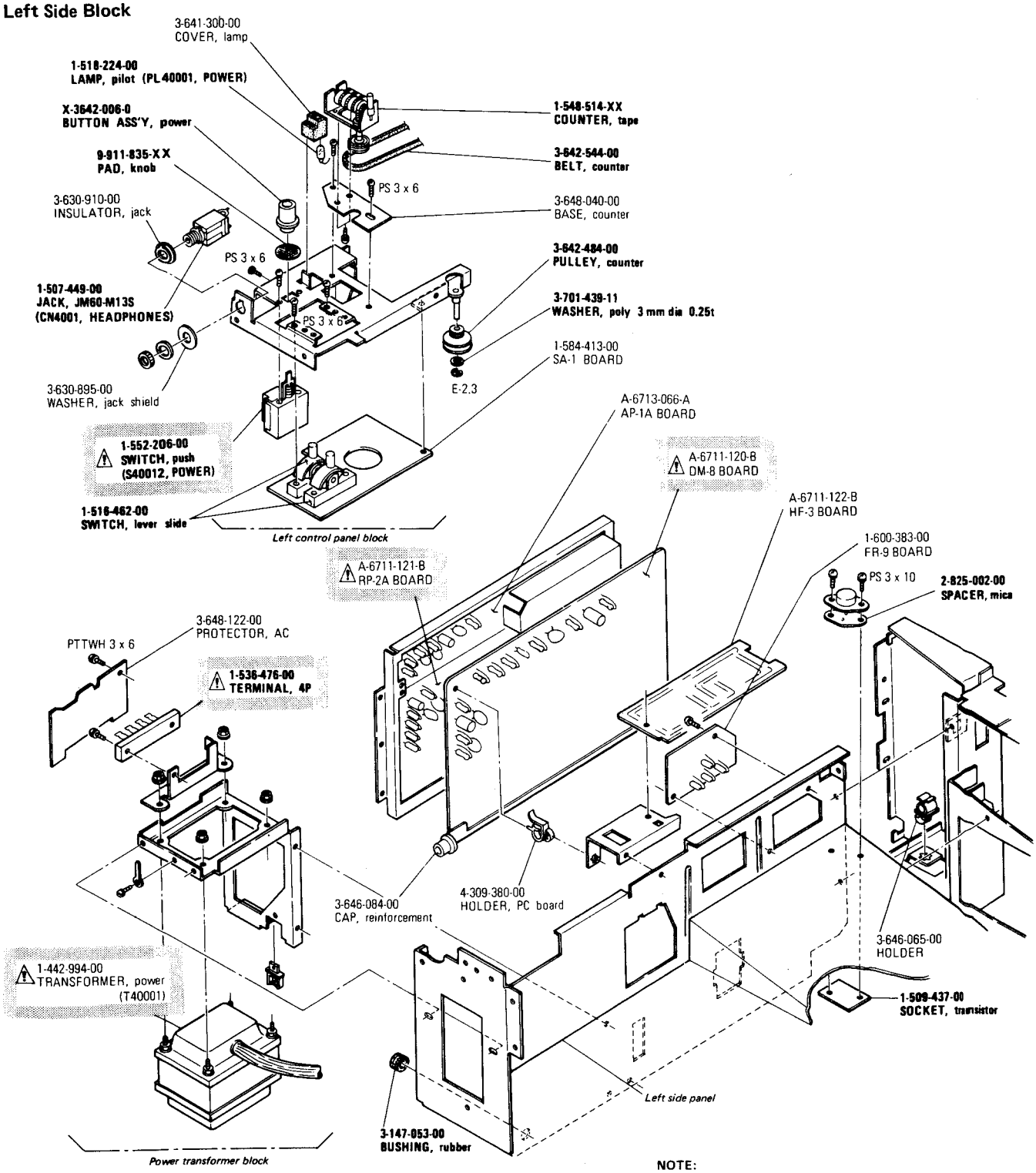
Right Side Block



NOTE:

1. **The shaded and ⚠-marked components are critical to safety.**
   Replace only with same component as specified.
2. Parts printed in **Bold-Face type** are normally stocked for replacement purposes. The remaining parts shown in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.
3. Item with no part number and/or no description are not stocked because they are seldom required for routine service.

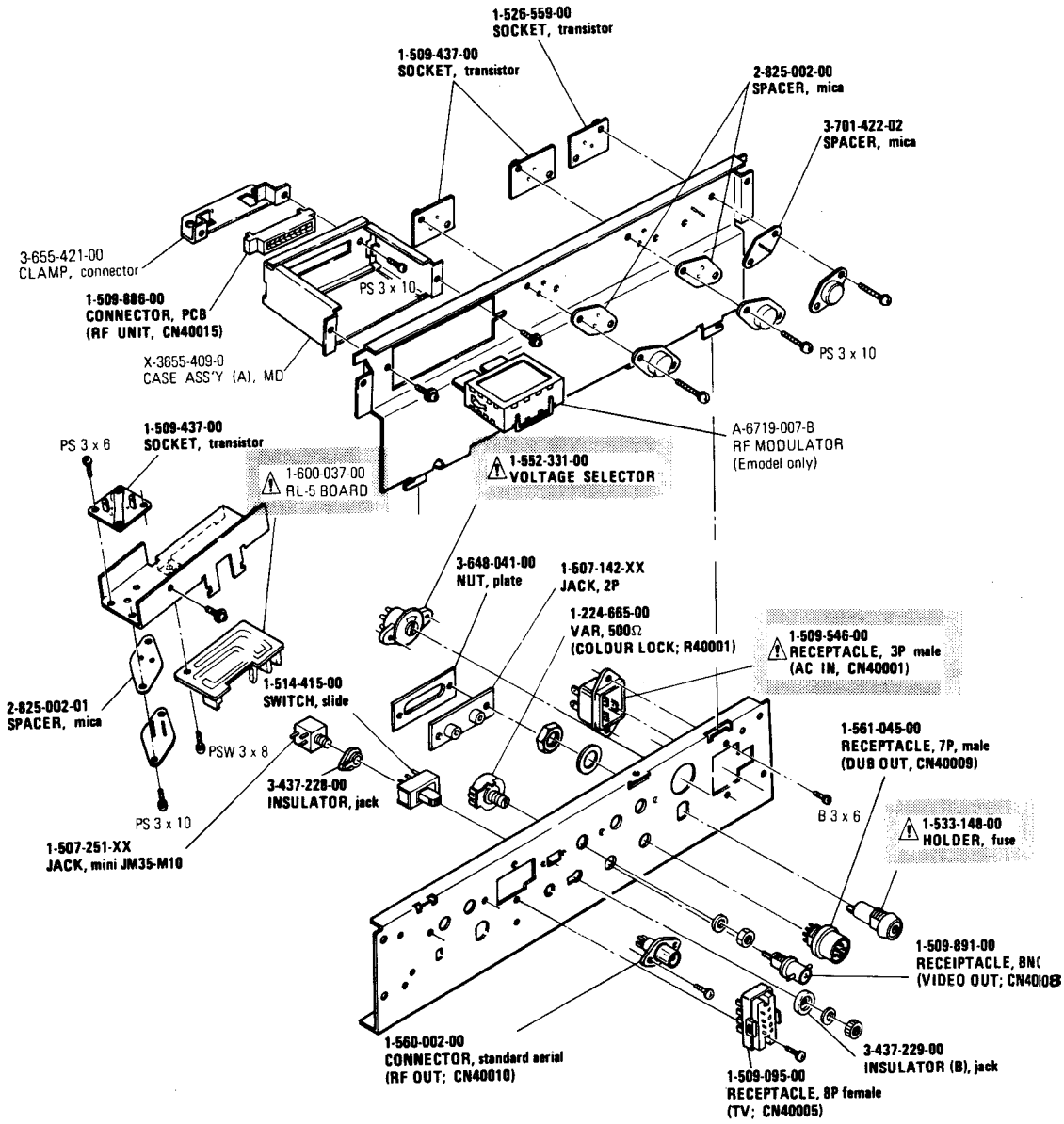
Left Side Block



NOTE:

1. **The shaded and ⚠-marked components are critical to safety.**
   Replace only with same component as specified.
2. Parts printed in **Bold-Face type** are normally stocked for replacement purposes. The remaining parts shown in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.
3. Item with no part number and/or no description are not stocked because they are seldom required for routine service.

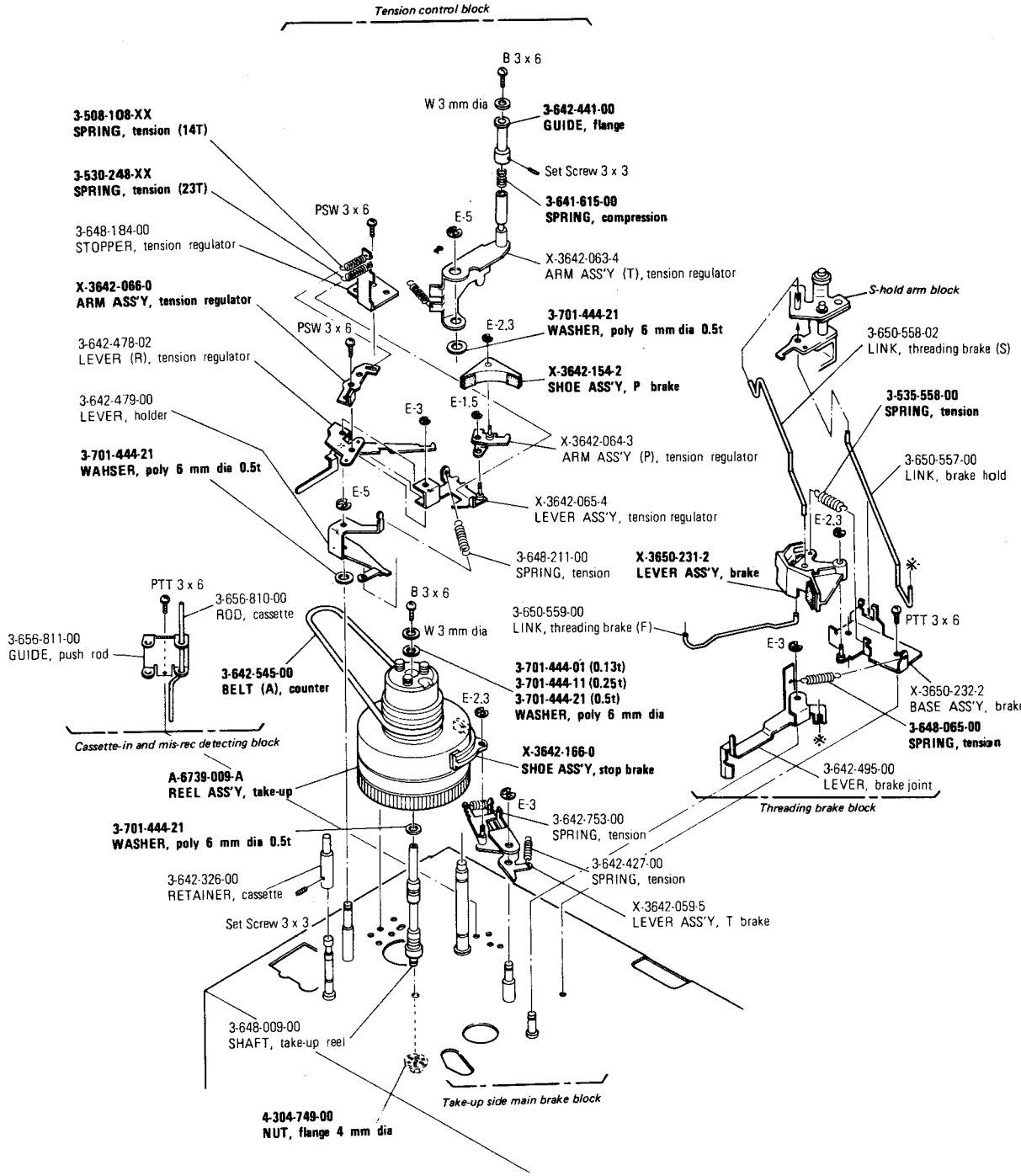
Connector Panel Block



NOTE:

1. The shaded and ⚠-marked components are critical to safety.
   Replace only with same component as specified.
2. Parts printed in **Bold-Face** type are normally stocked for replacement purposes. The remaining parts shown in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.
3. Item with no part number and/or no description are not stocked because they are seldom required for routine service.

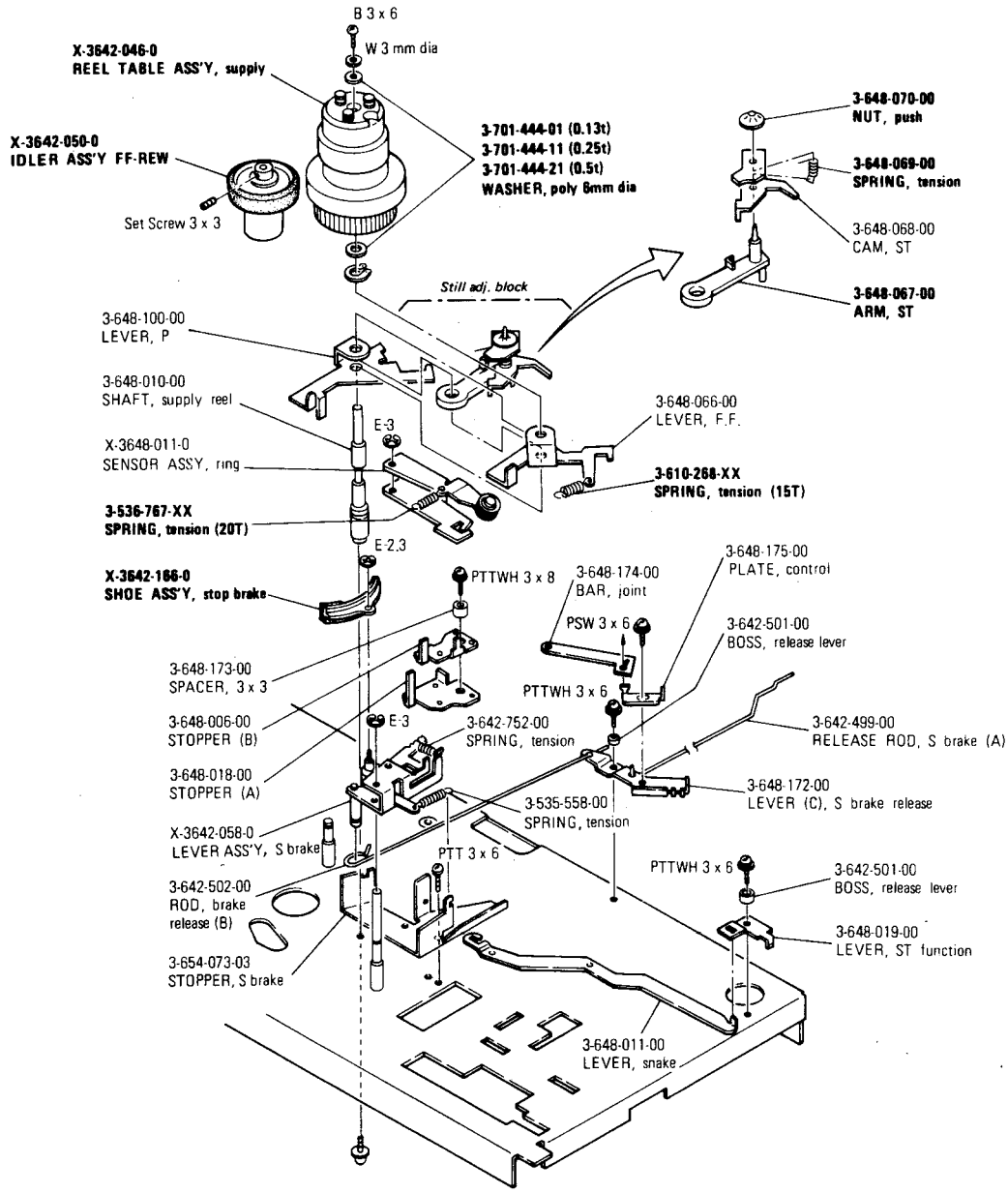
Link Block (1) ..... take-up side



NOTE:

1. Parts printed in **Bold-Face type** are normally stocked for replacement purposes. The remaining parts shown in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.
2. Item with no part number and/or no description are not stocked because they are seldom required for routine service.

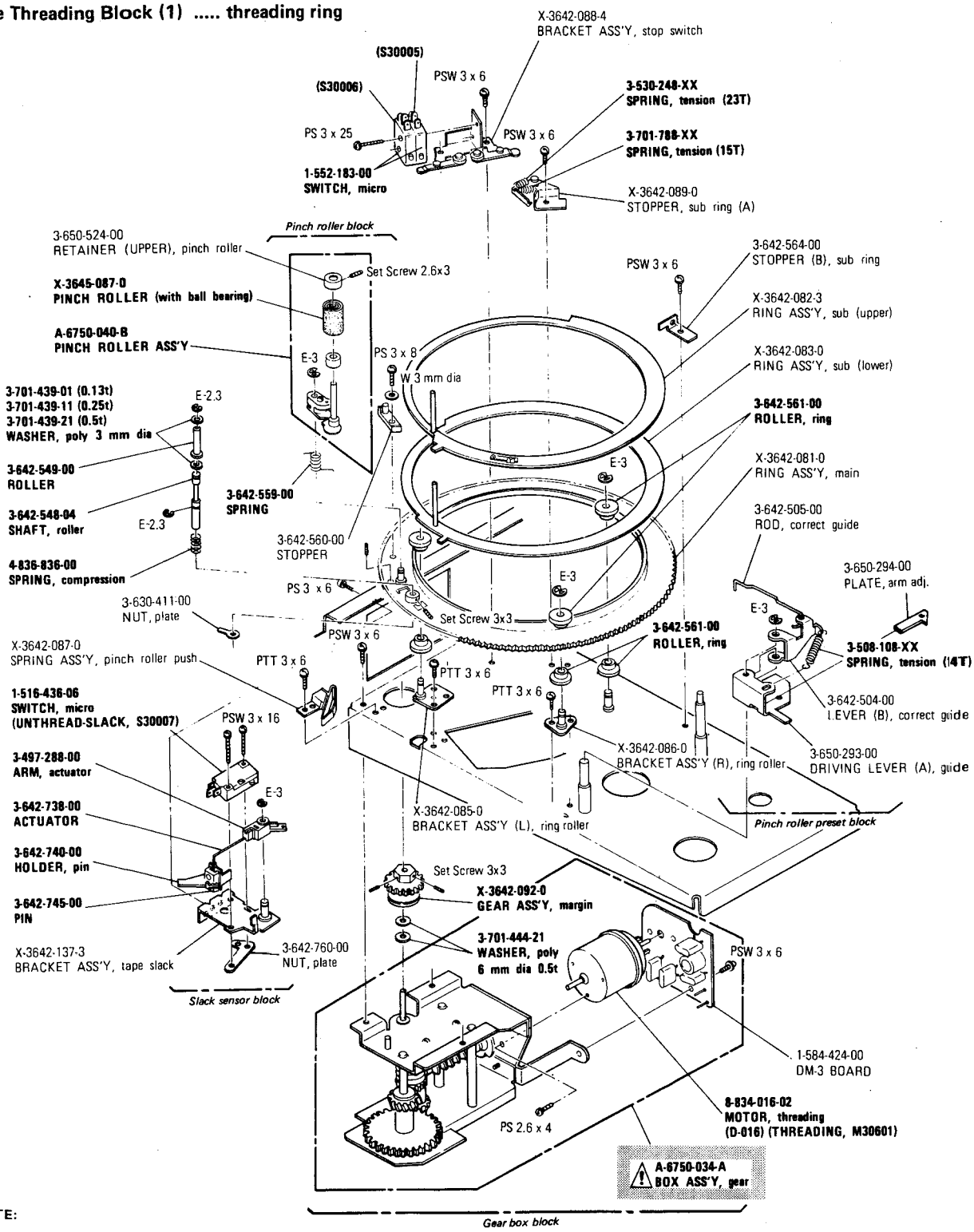
Link Block (2) ..... supply side



NOTE:

1. Parts printed in **Bold-Face type** are normally stocked for replacement purposes. The remaining parts shown in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.
2. Item with no part number and/or no description are not stocked because they are seldom required for routine service.

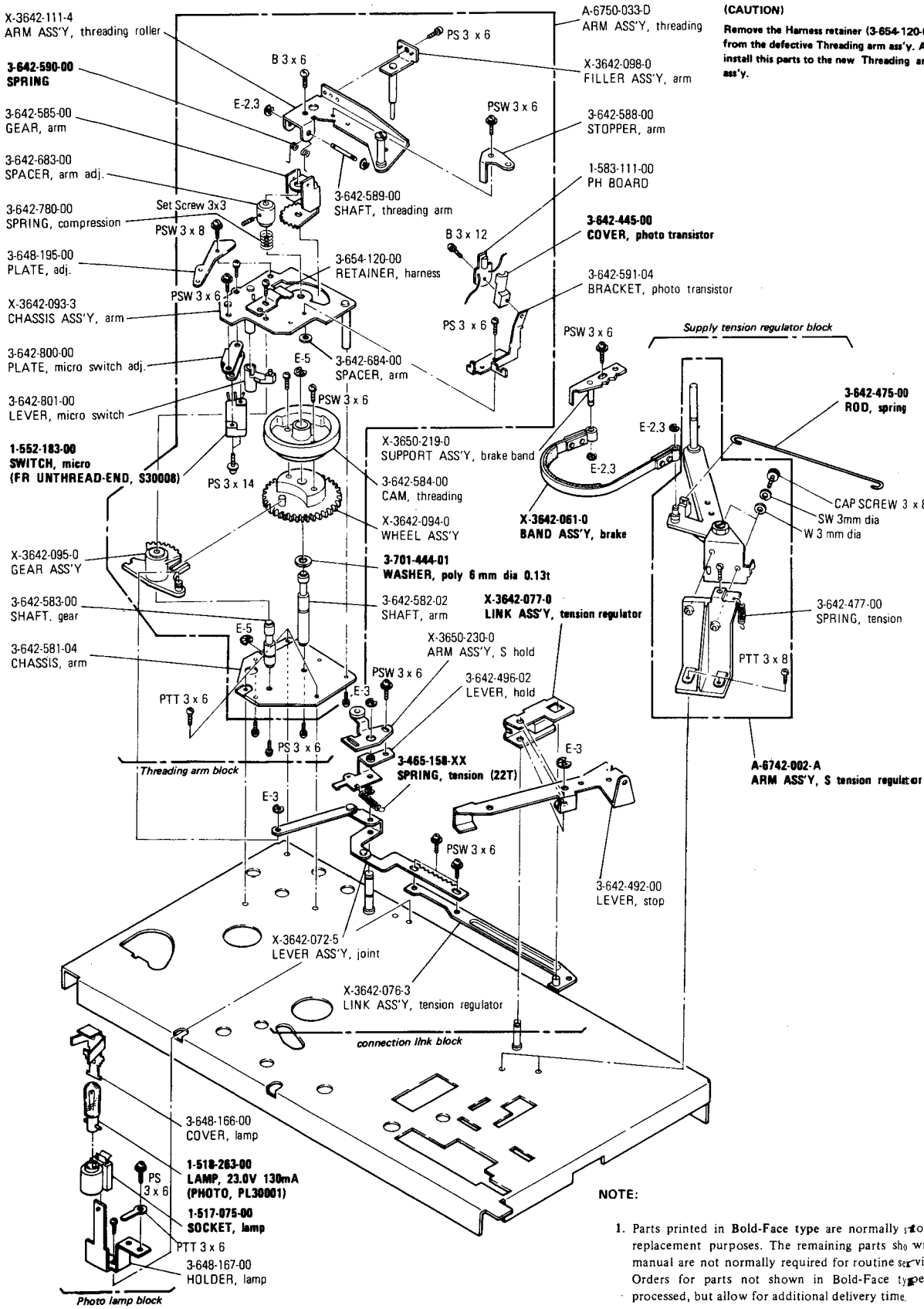
Tape Threading Block (1) ..... threading ring



NOTE:

1. **The shaded and ⚠-marked components are critical to safety.**
   Replace only with same component as specified.
2. Parts printed in **Bold-Face type** are normally stocked for replacement purposes. The remaining parts shown in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.
3. Item with no part number and/or no description are not stocked because they are seldom required for routine service.

Tape Threading Block (2) ..... threading arm



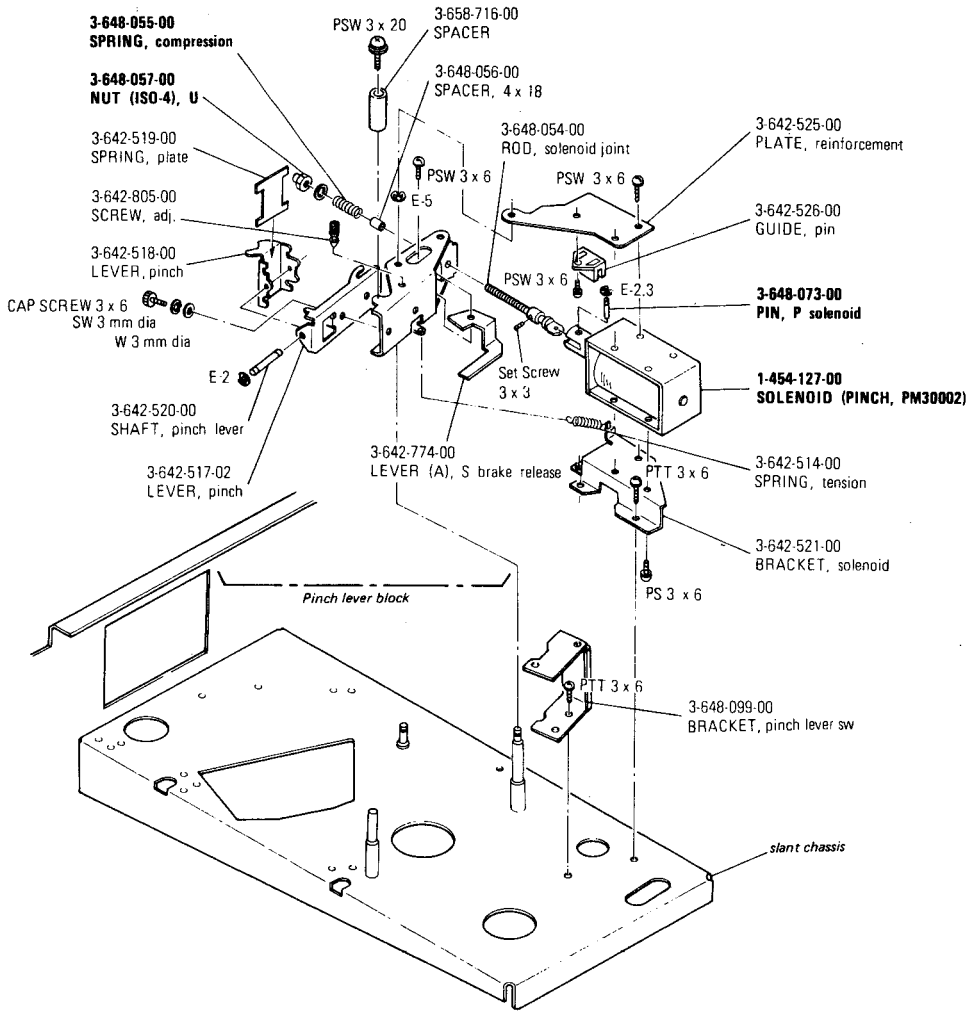
(CAUTION)

Remove the Harness retainer (3-654-120-00) from the defective Threading arm ass'y. And install this parts to the new Threading arm ass'y.

NOTE:

1. Parts printed in **Bold-Face type** are normally stocked for replacement purposes. The remaining parts shown in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.
2. Item with no part number and/or no description are not stocked because they are seldom required for routine service.

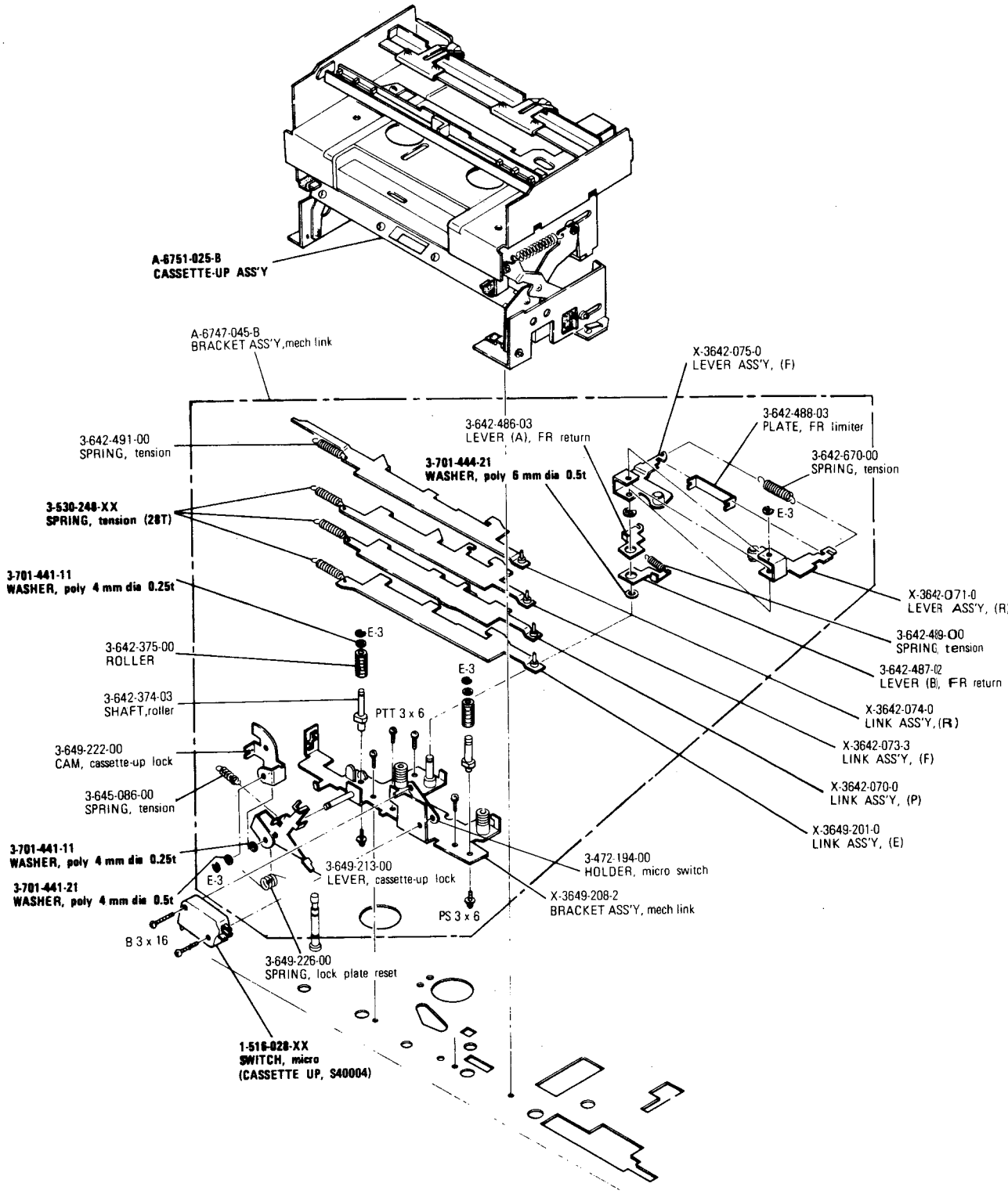
Pinch Lever Block



NOTE:

1. Parts printed in **Bold-Face type** are normally stocked for replacement purposes. The remaining parts shown in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.
2. Item with no part number and/or no description are not stocked because they are seldom required for routine service.

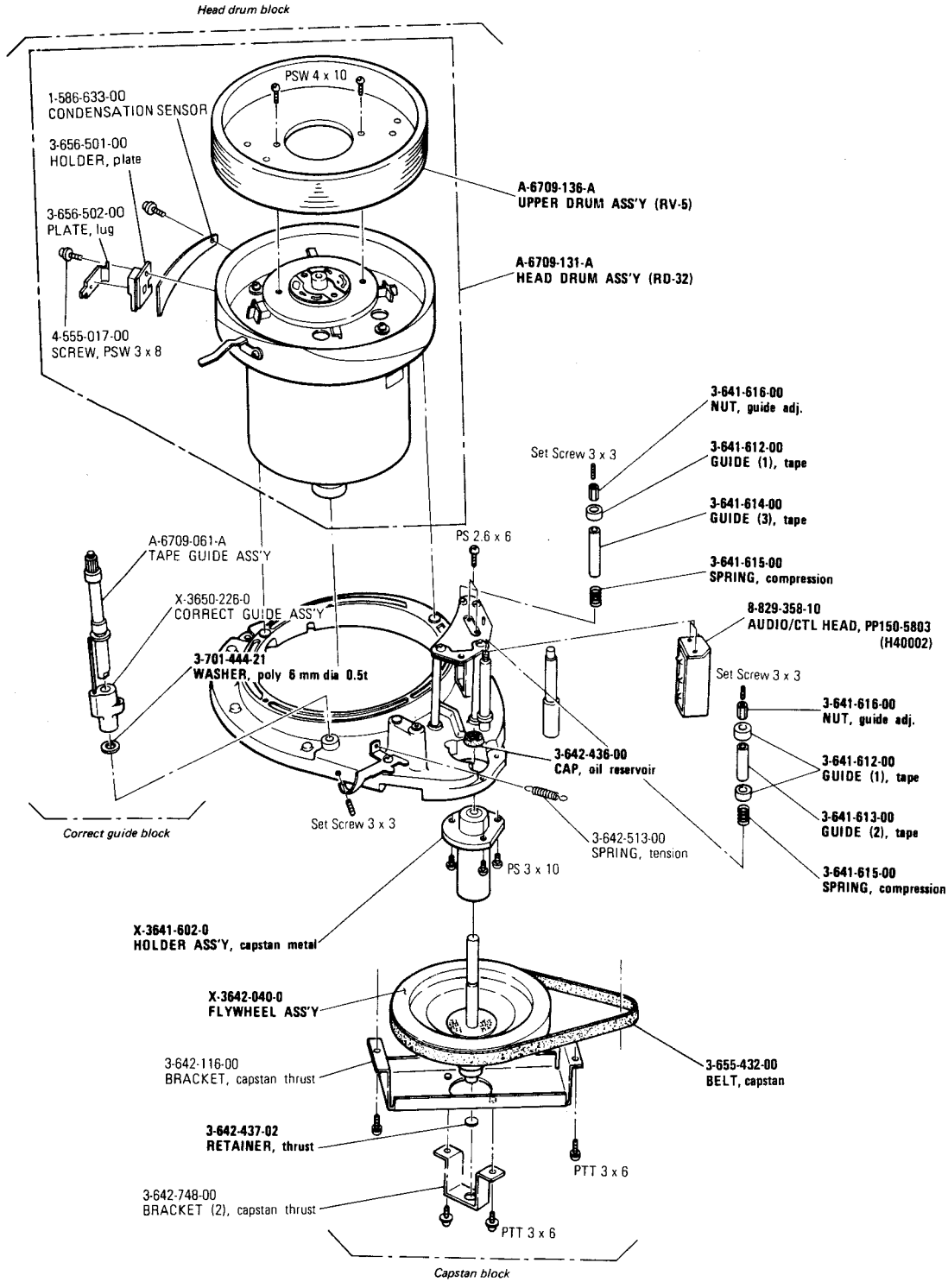
Mechanical Link and Cassette-up Block



NOTE:

1. Parts printed in **Bold-Face type** are normally stocked for replacement purposes. The remaining parts shown in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.
2. Item with no part number and/or no description are not stocked because they are seldom required for routine service.

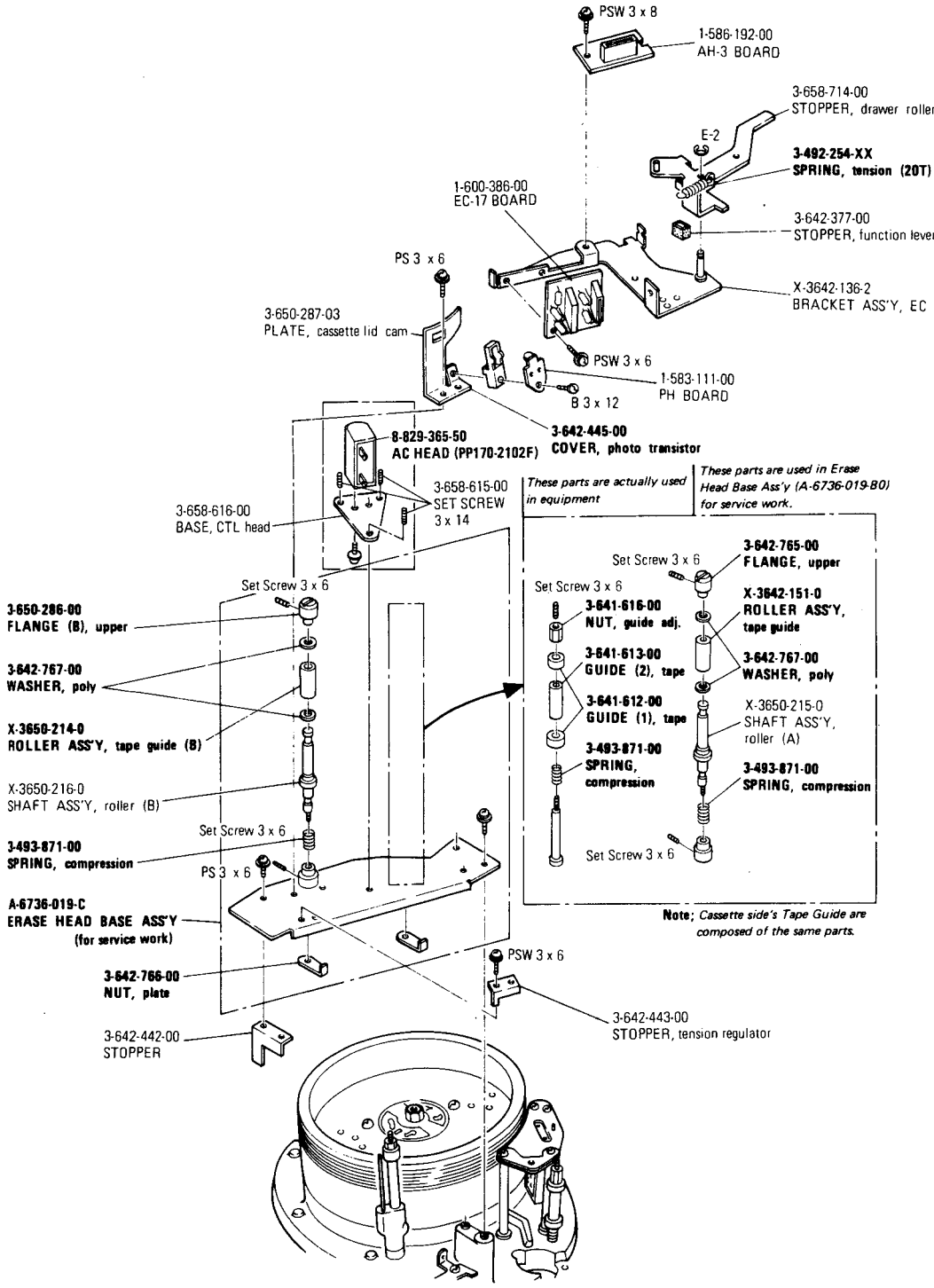
Head Drum and Slant Base Block



NOTE:

1. Parts printed in **Bold-Face type** are normally stocked for replacement purposes. The remaining parts shown in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.
2. Item with no part number and/or no description are not stocked because they are seldom required for routine service.

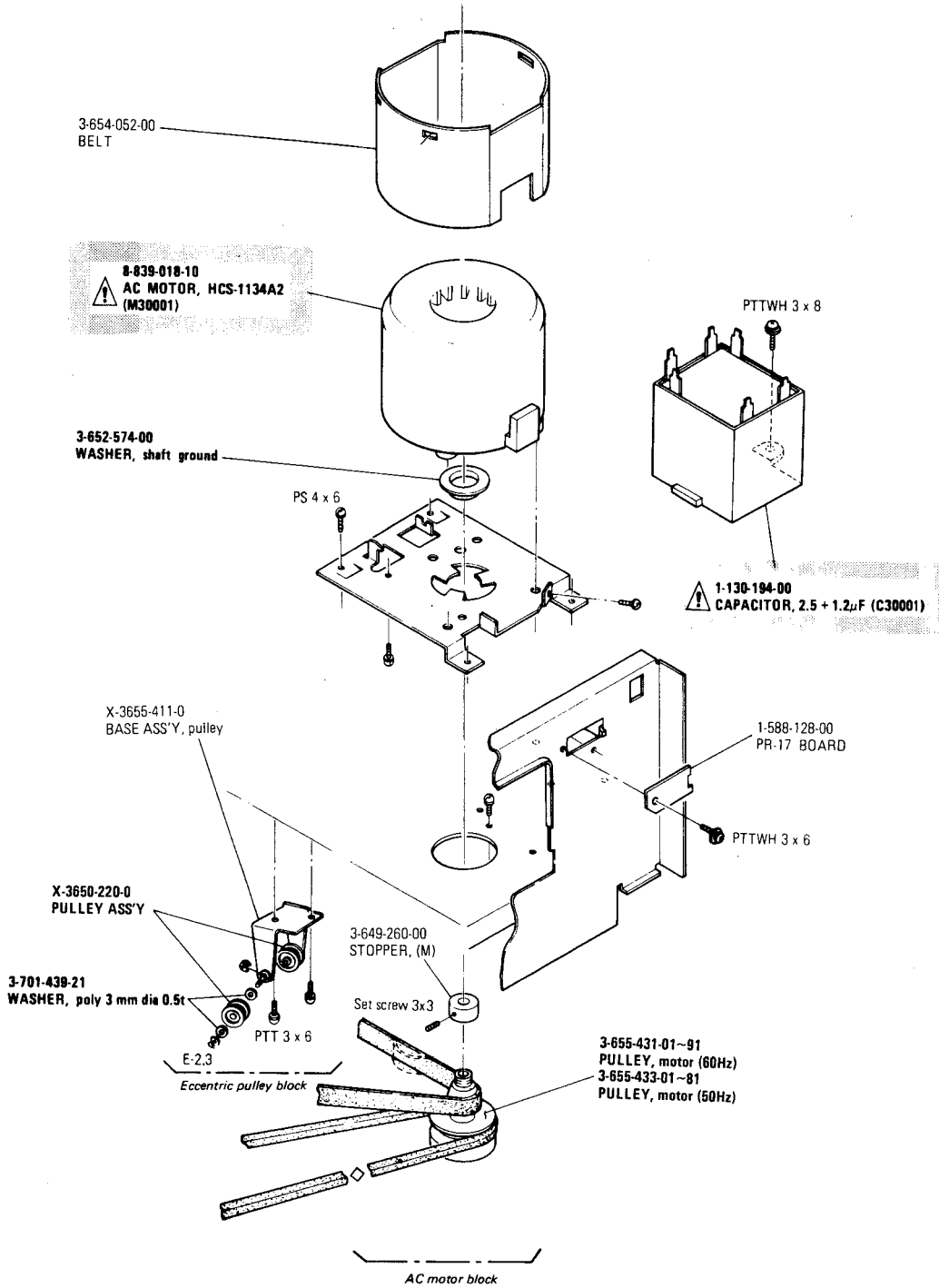
Erase Head Block



NOTE:

1. Parts printed in **Bold-Face type** are normally stocked for replacement purposes. The remaining parts shown in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.
2. Item with no part number and/or no description are not stocked because they are seldom required for routine service.

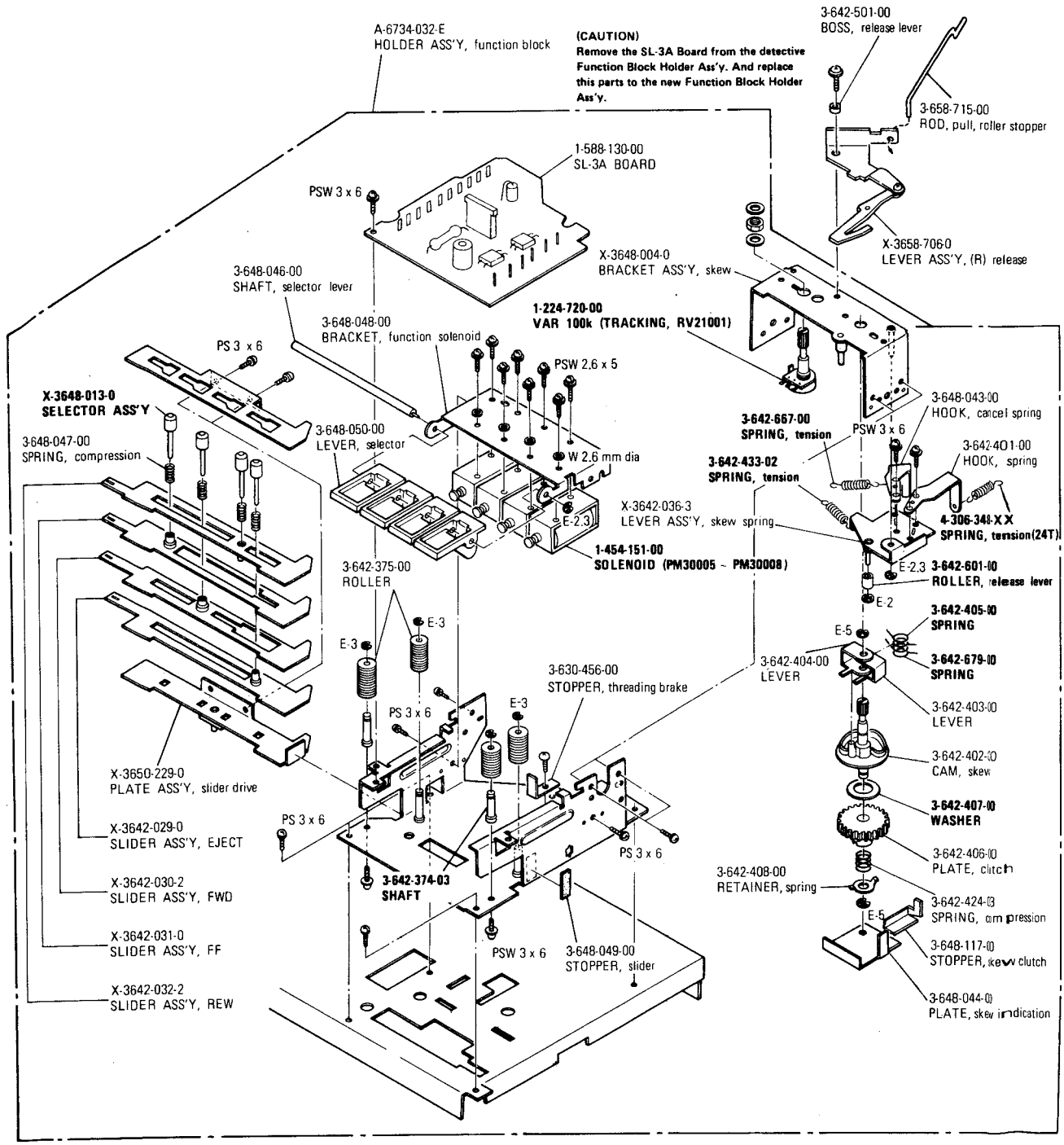
Motor Block



NOTE:

1. **The shaded and ⚠-marked components are critical to safety.**
   Replace only with same component as specified.
2. Parts printed in **Bold-Face type** are normally stocked for replacement purposes. The remaining parts shown in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.
3. Item with no part number and/or no description are not stocked because they are seldom required for routine service.

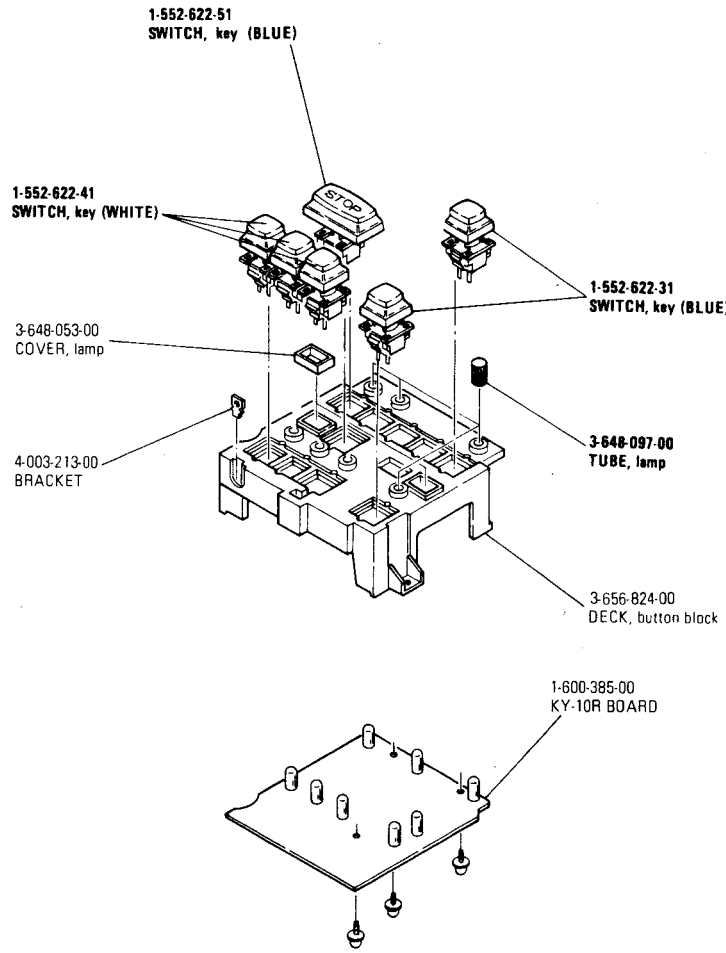
Function Block



NOTE:

1. Parts printed in **Bold-Face type** are normally stocked for replacement purposes. The remaining parts shown in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.
2. Item with no part number and/or no description are not stocked because they are seldom required for routine service.

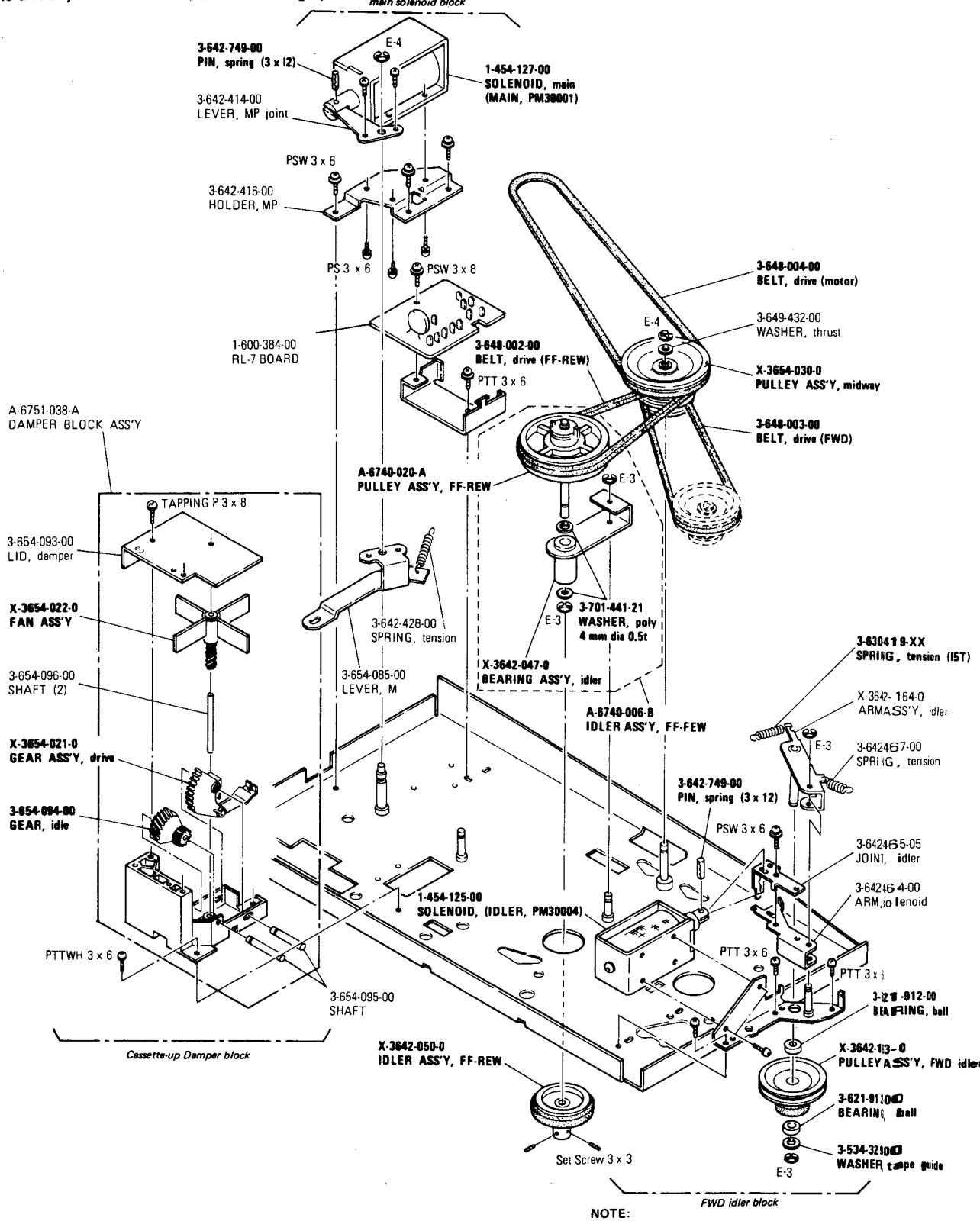
Function Button Block



NOTE:

1. Parts printed in **Bold-Face type** are normally stocked for replacement purposes. The remaining parts shown in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.
2. Item with no part number and/or no description are not stocked because they are seldom required for routine service.

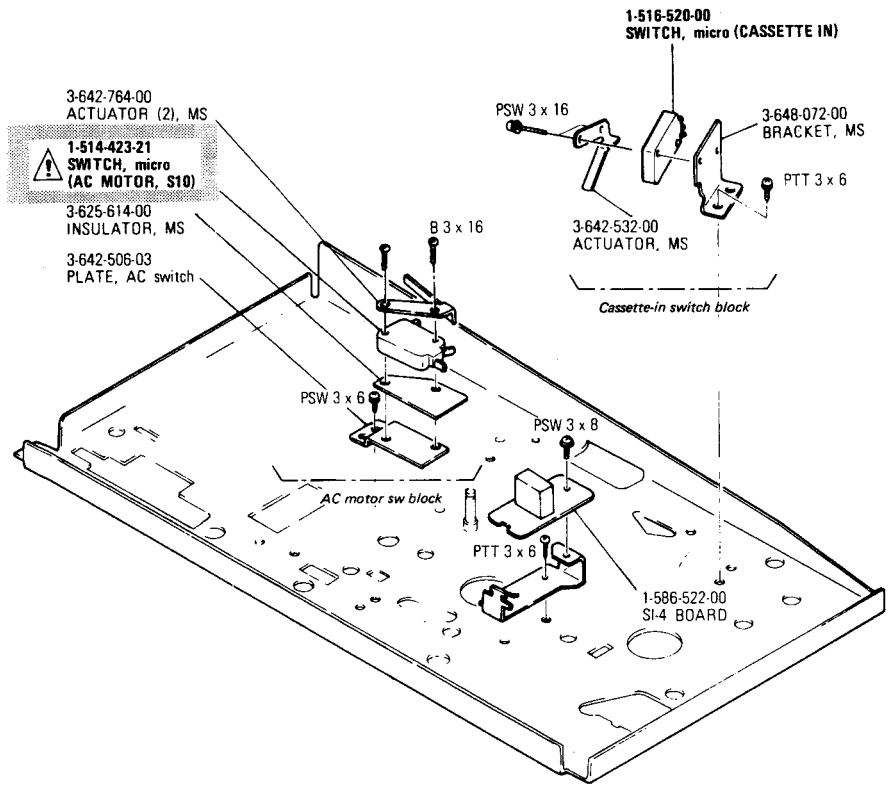
Chassis Block, bottom view (1) ..... driving system



NOTE:

1. Parts printed in **Bold-Face type** are normally stocked for replacement purposes. The remaining parts shown in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.
2. Item with no part number and/or no description are not stocked because they are seldom required for routine service.

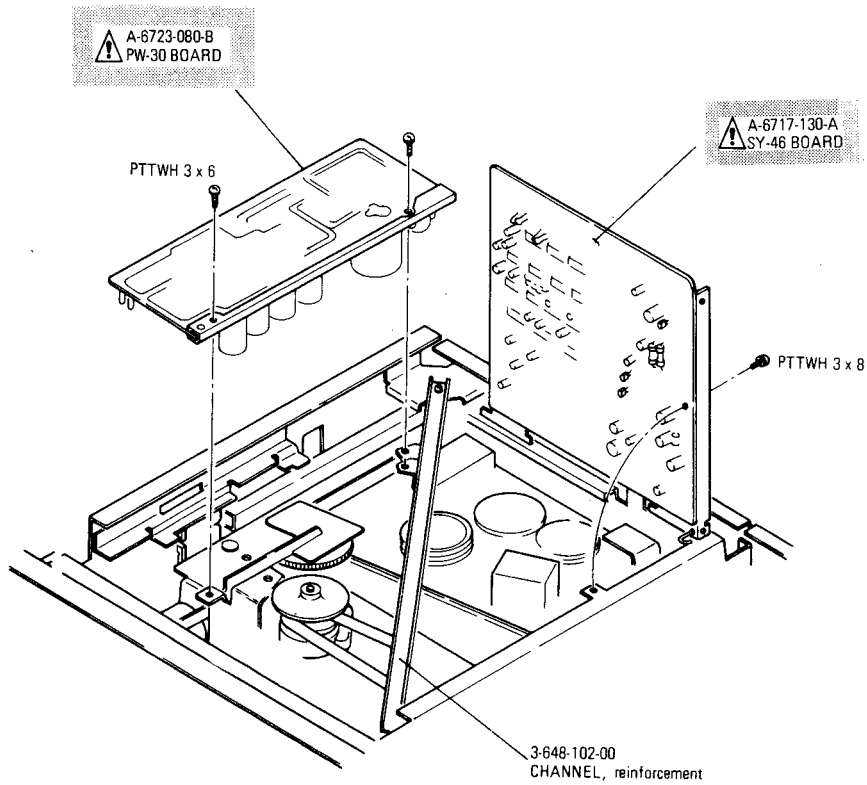
Chassis Block, bottom view (2) ..... micro switch block



NOTE:

1. Parts printed in **Bold-Face type** are normally stocked for replacement purposes. The remaining parts shown in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.
2. Item with no part number and/or no description are not stocked because they are seldom required for routine service.

Chassis Block, bottom view (3) ..... printed circuit boards



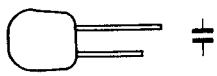
NOTE:

1. **The shaded and ⚠-marked components are critical to safety.**
   Replace only with same component as specified.
2. Parts printed in **Bold-Face type** are normally stocked for replacement purposes. The remaining parts shown in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.
3. Item with no part number and/or no description are not stocked because they are seldom required for routine service.

13-3. ELECTRICAL PARTS LIST

Parts that are not listed in the "reference numbers order list" are shown in following table.
Reference numbers are omitted.

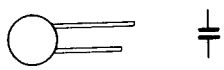
SILVERED MICA CAPACITOR 1 pF through 620 pF ±5%, 50WV



Parts No. 1-107-□□□-00

Value	Parts No. -□□□-	Value	Parts No. -□□□-	Value	Parts No. -□□□-	Value	Parts No. -□□□-
1 pF	098	15 pF	065	51 pF	078	180 pF	091
2	099	16	066	56	079	200	092
3	100	18	067	62	080	220	093
4	101	20	068	68	081	240	094
5	102	22	069	75	082	270	095
6	103	24	070	82	083	300	096
7	104	27	071	91	084	330	097
8	105	30	072	100	085	360	231
9	106	33	073	110	086	390	232
10	061	36	074	120	087	430	233
11	062	39	075	130	088	470	234
12	063	43	076	150	089	510	235
13	064	47	077	160	090	560	236
						620	237

CERAMIC CAPACITOR 0.001μF through 0.1μF 50WV



Parts NO. 1-161-□□□-00

Value	Parts No. -□□□-	Substitute
0.001 μF	039	(1-102-074-00)
0.0012	040	
0.0015	041	
0.0018	042	
0.0022	043	(1-102-100-00)
0.0027	044	
0.0033	045	
0.0039	046	(1-102-124-00)
0.0047	047	
0.0056	048	
0.0068	049	
0.0082	050	

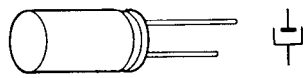
Value	Parts No. -□□□-	Substitute
0.01 μF	051	(1-101-118-00)
0.012	052	
0.015	053	
0.018	054	
0.022	055	(1-101-005-00)
0.027	056	
0.033	057	
0.039	058	
0.047	059	(1-101-006-00)
0.056	060	
0.068	061	
0.082	062	
0.1	063	

NOTE:

1. **The shaded and ⚠-marked components are critical to safety.**
   Replace only with same components as specified.

2. Parts printed in **Bold-Face type** are normally stocked for replacement purposes. The remaining parts shown in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.

ELECTROLYTIC CAPACITOR 0.47μF through 470μF
6.3WV through 50 (63, 100)WV



Parts No. 1-123-□□□-00

Value		Parts No. -□□□-
0.47μF	50V	
	100	379
1	50	
	100	380
2.2	50	
	100	381
3.3	25	
	35	
	50	
	100	382
4.7	25	
	35	
	50	
	63	369
10	10	
	16	
	25	
	35	
	50	356
22	16	
	25	330

Value		Parts No. -□□□-
22μF	35V	342
	50	
	63	371
33	6.3	
	10	
	16	318
	25	
	35	343
	50	
	63	372
47	6.3	
	10	306
	16	
	25	332
	35	
	50	359
100	6.3	
	10	307
	16	
	25	333
	35	345

Value		Parts No. -□□□-
100μF	50V	360
220	6.3	
	10	308
	16	321
	25	334
	35	346
	50	361
330	6.3	
	10	309
	16	322
	25	335
	35	347
	50	362
470	6.3	298
	10	310
	16	323
	25	336
	35	348
	50	
	63	377

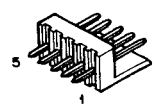
NOTE:

1. **The shaded and ⚠-marked components are critical to safety.**
Replace only with same components as specified.

2. Parts printed in **Bold-Face type** are normally stocked for replacement purposes. The remaining parts shown in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.

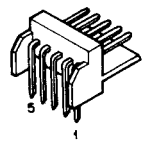
CONNECTOR

top-type receptacle



3P	1-560-008-00
5P	1-560-009-00
6P	1-560-010-00
8P	1-560-011-00
10P	1-560-012-00
12P	1-560-013-00

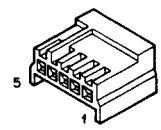
side-type receptacle



3P	1-560-014-00
5P	1-560-015-00
6P	1-560-016-00
8P	1-560-017-00
10P	1-560-018-00
12P	1-560-019-00

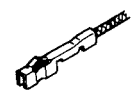
plug

housing



3P	1-561-155-00
5P	1-561-156-00
6P	1-561-157-00
8P	1-561-158-00
10P	1-561-159-00
12P	1-561-160-00

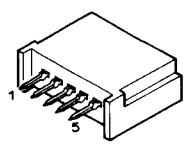
contact



1-560-006-00
(AWG 20 ~ 26)

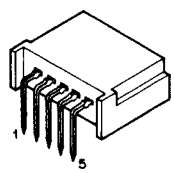
1-560-007-00
(AWG 26 ~ 30)

top-type receptacle



5P	1-509-633-00
10P	1-509-634-00

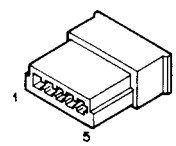
side-type receptacle



5P	1-509-635-00
10P	1-509-636-00

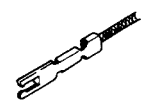
plug

housing



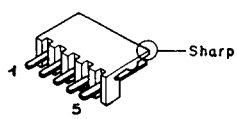
5P	1-508-670-00
10P	1-508-671-00

contact



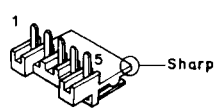
1-535-083-00

top-type receptacle



2P	1-508-900-00
3P	1-508-901-00
4P	1-508-902-00
5P	1-508-903-00
6P	1-508-904-00
8P	1-508-905-00
10P	1-508-906-00
12P	1-508-949-00

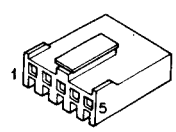
side-type receptacle



2P	1-508-933-00
3P	1-508-934-00
4P	1-508-950-00
5P	1-508-935-00
6P	1-508-936-00
8P	1-508-937-00
10P	1-508-951-00
12P	1-508-997-00

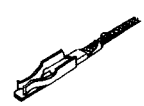
plug

housing



2P	1-509-983-00
3P	1-509-984-00
4P	1-509-985-00
5P	1-509-986-00
6P	1-509-987-00
8P	1-509-988-00
10P	1-509-989-00
12P	1-561-056-00

contact



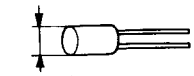
1-509-982-00

NOTE:

1. **The shaded and ⚠-marked components are critical to safety.**
   Replace only with same components as specified.

2. Parts printed in **Bold-Face type** are normally stocked for replacement purposes. The remaining parts shown in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.

MICRO INDUCTOR 1 μH through 470 μH

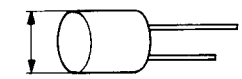


5mm dia

Parts No. 1-407-□□□-XX

Value	Parts No. -□□□-	Value	Parts No. -□□□-	Value	Parts No. -□□□-	Value	Parts No. -□□□-
1 μH	178	4.7 μH	186	22 μH	161	100 μH	169
1.2	179 – 00	5.6	187	27	162	120	170
1.5	180	6.8	188	33	163	150	171
1.8	181	8.2	189	39	164	180	172
2.2	182	10	157	47	165	220	173
2.7	183	12	158	56	166	270	174
3.3	184	15	159	68	167	330	175
3.9	185	18	160	82	168	390	176
						470	177

MICRO INDUCTOR 470 μH through 33 mH



10mm dia

Parts No. 1-407-□□□-XX

Value	Parts No. -□□□-	Value	Parts No. -□□□-	Value	Parts No. -□□□-	Value	Parts No. -□□□-
470 μH	191	1.5 mH	213	4.7 mH	202	15 mH	208
560	192	1.8	197	5.6	203	18	209
680	193	2.2	198	6.8	204	22	210
820	194	2.7	199	8.2	205	27	211
1 mH	195	3.3	200	10	206	33	212
1.2	196	3.9	201	12	207		

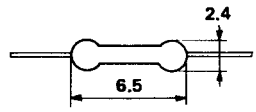
NOTE:

1. **The shaded and ⚠-marked components are critical to safety.**
   Replace only with same components as specified.

2. Parts printed in **Bold-Face type** are normay stocked for replacement purposes. The remaining partsshvvon in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.

CARBON RESISTOR (1/4W)

± 5%, 1/4W, non-special type
1 Ω through 1 MΩ



Parts No. 1-246-□□□-00

Value	Parts No. –□□□–
1 Ω	401
1.1	402
1.2	403
1.3	404
1.5	405
1.6	406
1.8	407
2	408
2.2	409
2.4	410
2.7	411
3	412
3.3	413
3.6	414
3.9	415
4.3	416
4.7	417
5.1	418
5.6	419
6.2	420
6.8	421
7.5	422
8.2	423
9.1	424
10 Ω	425
11	426
12	427
13	428
15	429
16	430
18	431
20	432
22	433
24	434
27	435
30	436

Value	Parts No. –□□□–
33 Ω	437
36	438
39	439
43	440
47	441
51	442
56	443
62	444
68	445
75	446
82	447
91	448
100 Ω	449
110	450
120	451
130	452
150	453
160	454
180	455
200	456
220	457
240	458
270	459
300	460
330	461
360	462
390	463
430	464
470	465
510	466
560	467
620	468
680	469
750	470
820	471
910	472

Value	Parts No. –□□□–
1 kΩ	473
1.1	474
1.2	475
1.3	476
1.5	477
1.6	478
1.8	479
2	480
2.2	481
2.4	482
2.7	483
3.0	484
3.3	485
3.6	486
3.9	487
4.3	488
4.7	489
5.1	490
5.6	491
6.2	492
6.8	493
7.5	494
8.2	495
9.1	496
10 kΩ	497
11	498
12	499
13	500
15	501
16	502
18	503
20	504
22	505
24	506
27	507
30	508

Value	Parts No. –□□□–
33 kΩ	509
36	510
39	511
43	512
47	513
51	514
56	515
62	516
68	517
75	518
82	519
91	520
100 kΩ	521
110	522
120	523
130	524
150	525
160	526
180	527
200	528
220	529
240	530
270	531
300	532
330	533
360	534
390	535
430	536
470	537
510	538
560	539
620	540
680	541
750	542
820	543
910	544
1 MΩ	545

NOTE:

1. **The shaded and ⚠-marked components are critical to safety.**
   Replace only with same components as specified.

2. Parts printed in **Bold-Face type** are normally stocked for replacement purposes. The remaining parts shwon in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.

ABBREVIATIONS

Ref. No.	Description	Ref. No.	Description	Ref. No.	Description
C□□, CT□□	CAPACITOR	IC□□	IC	Q□□	TRANSISTOR
CF□□	CERAMIC FILTER	J□□	JACK	R□□, RV□□	RESISTOR
CN□□	CONNECTOR	L□□	INDUCTOR	RY□□	RELAY
D□□	DIODE	M□□	MOTOR	S□□, SW□□	SWITCH
DL□□	DELAY LINE	ME□□	METER	SB□□	SOLAR BATTERY
F□□	FUSE	MIC□□	MICROPHONE	T□□	TRANSFORMER
FB□□	FERRITE BEAD	PG□□	PG COIL	TH□□	THERMISTOR
FL□□	FILTER	PL□□	LAMP	X□□	CRYSTAL
H□□	HEAD	PM□□	SOLENOIDE		

All capacitors are in micro farads unless otherwise specified.

All inductors are in micro henries unless otherwise specified.

All resistors are in ohms.

Ref. No.	Parts No.	Description
AH-3 BOARD		
	1-586-192-00	PRINTED WIRING BOARD, AH-3
AP-1A BOARD		
	A-6713-066-A	MOUNTED BOARD, AP-1A
C103	**1-102-959-00**	**CERAMIC 22PF 10% 50V**
C109	**1-108-583-00**	**MYLAR 0.015 5% 50V**
C113	**1-131-209-00**	**TANTALUM 0.1 10% 35V**
C114	**1-101-880-00**	**CERAMIC 47PF 10% 50V**
C118	**1-102-954-00**	**CERAMIC 10PF 10% 50V**
C203	**1-102-954-00**	**CERAMIC 22PF 10% 50V**
C209	**1-108-583-00**	**MYLAR 0.015 5% 50V**
C213	**1-131-209-00**	**TANTALUM 0.1 10% 35V**
C214	**1-101-880-00**	**CERAMIC 47PF 10% 50V**
C218	**1-102-954-00**	**CERAMIC 10PF 10% 50V**
D101	**8-719-815-55**	**1S1555**
D201	**8-719-815-55**	**1S1555**
IC101	**8-759-271-22**	**TA7122BP (TOSHIBA)**
IC102	**8-759-271-22**	**TA7122BP (TOSHIBA)**
IC201	**8-759-271-22**	**TA7122BP (TOSHIBA)**
IC202	**8-759-271-22**	**TA7122BP (TOSHIBA)**

NOTE:

1. **The shaded and ⚠-marked components are critical to safety.**
   Replace only with same components as specified.

2. Parts printed in **Bold-Face type** are normally stocked for replacement purposes. The remaining parts shown in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.

Ref. No.	Parts No.	Description
Q101	8-729-663-47	2SC1364
Q102	8-729-663-47	2SC1364
Q201	8-729-663-47	2SC1364
Q202	8-729-663-47	2SC1364
R109	1-224-252-XX	VAR, 10K
R112	1-224-250-XX	VAR, 2.2K
R209	1-224-252-XX	VAR, 10K
R212	1-224-250-XX	VAR, 2.2K

DM-3 BOARD

	1-584-424-00	PRINTED WIRING BOARD, DM-3
FL601	1-231-191-00	FEED THROUGH
FL602	1-231-191-00	FEED THROUGH
M601	8-834-016-02	DO16 "THREADING"
⚠R601	1-207-907-00	WIREWOUND 1.2 10% 2W
T601	1-427-265-00	NOISE FILTER

DM-8 BOARD

⚠	A-6711-120-B	MOUNTED BOARD, DM-8

Ref. No.	Parts No.	Description
C3	1-131-219-00	TANTALUM 4.7 10% 35V
C4	1-131-219-00	TANTALUM 4.7 10% 35V
C5	1-108-595-00	MYLAR 0.047 5% 50V
C9	1-108-587-00	MYLAR 0.022 5% 50V
C12	1-108-587-00	MYLAR 0.022 5% 50V
C13	1-108-595-00	MYLAR 0.047 5% 50V
C21	1-131-213-00	TANTALUM 0.47 10% 35V
C22	1-108-571-00	MYLAR 0.0047 5% 50V
C24	1-108-587-00	MYLAR 0.022 5% 50V
C26	1-108-555-00	MYLAR 0.001 5% 50V
C27	1-108-587-00	MYLAR 0.022 5% 50V
C28	1-131-217-00	TANTALUM 2.2 10% 35V
C29	1-108-587-00	MYLAR 0.022 5% 50V
C30	1-108-587-00	MYLAR 0.022 5% 50V
C32	1-108-587-00	MYLAR 0.022 5% 50V
C33	1-108-587-00	MYLAR 0.022 5% 50V
C43	1-108-587-00	MYLAR 0.022 5% 50V
C49	1-108-555-00	MYLAR 0.001 5% 50V
C51	1-108-587-00	MYLAR 0.022 5% 50V
C55	1-131-217-00	TANTALUM 2.2 10% 35V
C63	1-108-587-00	MYLAR 0.022 5% 50V
C66	1-108-587-00	MYLAR 0.022 5% 50V
C68	1-109-166-00	DIPPED MICA 680PF 5% 300V
C78	1-131-237-00	TANTALUM 1.5 10% 25V
C84	1-108-571-00	MYLAR 0.0047 5% 50V
C86	1-131-217-00	TANTALUM 2.2 10% 35V
C88	1-131-217-00	TANTALUM 2.2 10% 35V
C91	1-131-199-00	TANTALUM 10 10% 16V
C99	1-108-579-00	MYLAR 0.01 5% 50V
C106	1-108-579-00	MYLAR 0.01 5% 50V
C107	1-108-579-00	MYLAR 0.01 5% 50V
C114	1-108-583-00	MYLAR 0.015 5% 50V
C115	1-108-567-00	MYLAR 0.0033 5% 50V
C116	1-108-567-00	MYLAR 0.0033 5% 50V
CF1	1-231-282-00	FILTER, CERAMIC 5.1MHz
CF2	1-231-302-00	FILTER, CERAMIC 4.27MHz
CF3	1-231-281-00	FILTER, CERAMIC 4.5MHz
D1	8-719-815-55	1S1555
D2	8-719-151-07	RD5.1E-B
D3	8-719-709-25	1S1925-P
D4	8-719-709-25	1S1925-P
D5	8-719-709-25	1S1925-P

NOTE:

1. **The shaded and ⚠-marked components are critical to safety.**
   Replace only with same components as specified.

2. Parts printed in **Bold-Face type** are normally stocked for replacement purposes. The remaining parts shown in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.

Ref. No.	Parts No.	Description
D6	8-719-815-55	1S1555
D7	8-719-815-55	1S1555
D8	8-719-815-55	1S1555
D9	8-719-815-55	1S1555
D10	8-719-815-55	1S1555
DL1	1-415-096-00	0.3μs
DL2	1-415-153-00	0.2μs
DL3	1-415-096-00	0.3μs
FL1	1-231-295-00	BANDPASS 4.3MHz
FL2	1-231-293-00	LOW-PASS 1MHz
IC1	8-751-360-00	CX-136A (SONY)
IC2	8-751-370-00	CX-137A (SONY)
IC3	8-759-902-21	SN74LS221N (TI)
IC4	8-751-450-00	CX-145 (SONY)
IC5	8-751-370-00	CX-137A (SONY)
IC6	8-751-350-00	CX-135 (SONY)
L2	1-407-838-00	VAR, 150
L7	1-407-288-00	VAR, 4.7mH
Q1	8-724-375-01	2SC403C
Q2	8-729-663-47	2SC1364
Q3	8-729-663-47	2SC1364
Q4	8-729-663-47	2SC1364
Q5	8-729-663-47	2SC1364
Q6	8-729-663-47	2SC1364
Q7	8-729-663-47	2SC1364
Q8	8-724-375-01	2SC403C
Q9	8-724-375-01	2SC403C
Q10	8-724-375-01	2SC403C
Q11	8-724-375-01	2SC403C
Q12	8-724-375-01	2SC403C
Q13	8-724-375-01	2SC403C
Q14	8-724-375-01	2SC403C
Q15	8-724-375-01	2SC403C
Q16	8-724-375-01	2SC403C
Q17	8-724-375-01	2SC403C
Q18	8-724-375-01	2SC403C
Q19	8-724-375-01	2SC403C
Q20	8-724-375-01	2SC403C

Ref. No.	Parts No.	Description
Q23	8-724-375-01	2SC403C
Q24	8-724-375-01	2SC403C
Q26	8-724-375-01	2SC403C
Q27	8-724-375-01	2SC403C
Q28	8-724-375-01	2SC403C
Q29	8-724-375-01	2SC403C
Q30	8-724-375-01	2SC403C
Q31	8-729-612-77	2SA1027R
Q32	8-729-612-77	2SA1027R
Q33	8-724-375-01	2SC403C
Q34	8-724-375-01	2SC403C
Q35	8-724-375-01	2SC403C
Q36	8-724-375-01	2SC403C
Q37	8-724-375-01	2SC403C
⚠R48	1-206-650-00	METAL 270 2W 5%
⚠R49	1-244-865-00	CARBON 470 1/2W 5%
⚠R50	1-206-641-00	METAL 110 2W 5%
⚠R68	1-206-648-00	METAL 220 2W 5%
⚠R112	1-217-420-00	FUSE 0.68 1/2W 10%
⚠R134	1-211-417-00	CARBON 22 1/8W 5%
R137	1-244-865-00	CARBON 470 1/2W 5%
R138	1-244-865-00	CARBON 470 1/2W 5%
⚠R144	1-217-391-00	FUSE 22 1/4W 5%
R157	1-244-865-00	CARBON 470 1/2W 5%
RV1	1-224-253-XX	VAR, 22K
RV2	1-224-249-XX	VAR, 1K
RV3	1-224-250-XX	VAR, 2.2K
RV4	1-224-250-XX	VAR, 2.2K
RV5	1-224-550-XX	VAR, 220
RV6	1-224-254-XX	VAR, 47K
RV7	1-224-254-XX	VAR, 47K

NOTE:

1. **The shaded and ⚠-marked components are critical to safety.**
   Replace only with same components as specified.

2. Parts printed in **Bold-Face type** are normally stocked for replacement purposes. The remaining parts shown in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.

Ref. No.	Parts No.	Description
RV8	**1-224-249-XX**	**VAR, 1K**
RV9	**1-224-249-XX**	**VAR, 1K**
RV12	**1-224-249-XX**	**VAR, 1K**
RV13	**1-224-134-XX**	**VAR, 470K**
RV14	**1-224-250-XX**	**VAR, 2.2K**
T1	**1-425-880-00**	**BURST AMP 4.43MHz**
T2	**1-425-878-00**	**RF 4.5MHz**
T3	**1-425-878-00**	**RF 4.5MHz**
T4	**1-405-667-00**	**OSC 3.58MHz**
T5	**1-415-085-11**	**EQT-3 1.42MHz**
X1	**1-527-231-00**	**4.433618MHz**
X2	**1-527-154-00**	**3.57954MHz**

EC-17 BOARD

	1-600-386-00	PRINTED WIRING BOARD, EC-17
R1	**1-213-209-00**	**METAL 1.5M 1/4W 5%**
TH1	**1-800-198-00**	**S1K**

FR-9 BOARD

	1-600-383-00	PRINTED WIRING BOARD, FR-9
D1	**8-719-815-55**	**1S1555**
D2	**8-719-815-55**	**1S1555**
D3	**8-719-815-55**	**1S1555**
D4	**8-719-815-55**	**1S1555**
D5	**8-719-815-55**	**1S1555**
Q1	**8-729-663-47**	**2SC1364**
Q2	**8-729-663-47**	**2SC1364**
R2	**1-213-209-00**	**METAL 1.5M 1/4W 5%**
TH1	**1-800-198-00**	**S1K**

HF-3 BOARD

	A-6711-122-B	MOUNTED BOARD, HF-3
Q1	**8-724-375-01**	**2SC403C**
Q2	**8-724-375-01**	**2SC403C**
Q3	**8-724-375-01**	**2SC403C**
Q4	**8-724-375-01**	**2SC403C**
Q5	**8-729-663-47**	**2SC1364**

KY-10 (P) BOARD

	1-600-385-00	PRINTED WIRING BOARD, KY-10
D1	**8-719-812-41**	**TLR124**
D2	**8-719-812-41**	**TLR124**
D3	**8-719-812-41**	**TLR124**

NOTE:

1. **The shaded and ⚠-marked components are critical to safety.**
   Replace only with same components as specified.

2. Parts printed in **Bold-Face type** are normally stocked for replacement purposes. The remaining parts shwon in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.

Ref. No.	Parts No.	Description
D6	8-719-815-55	1S1555
D7	8-719-815-55	1S1555
D8	8-719-815-55	1S1555
PL1	1-518-262-00	5.0V 60MA
PL2	1-518-262-00	5.0V 60MA
PL3	1-518-262-00	5.0V 60MA
PL4	1-518-262-00	5.0V 60MA
Q1	8-729-663-47	2SC1364
Q2	8-729-663-47	2SC1364
Q3	8-729-663-47	2SC1364
Q4	8-729-663-47	2SC1364
Q5	8-729-663-47	2SC1364
S1	1-552-622-41	KEY, WHITE "F FWD"
S2	1-552-622-41	KEY, WHITE "PLAY"
S3	1-552-622-41	KEY, WHITE "REW"
S4	1-552-622-31	KEY, BLUE "EJECT"
S5	1-552-622-51	KEY, BLUE "STOP"
S6	1-552-622-31	KEY, BLUE "PAUSE"

PH BOARD

	1-583-111-00	PRINTED WIRING BOARD, PH

PR-17 BOARD

	1-588-128-00	PRINTED WIRING BOARD, PR-17
D1	8-719-200-02	10E2

Ref. No.	Parts No.	Description
PW-30 BOARD		
	⚠ A-6723-080-B	MOUNTED BOARD, PW-30
	1-533-037-XX	HOLDER, FUSE
C1	1-123-119-00	ELECT 4,700 50V
C7	1-123-403-00	ELECT 4.700 25V
C8	1-123-338-00	ELECT 2,200 25V
C14	1-123-338-00	ELECT 2,200 25V
C20	1-123-325-00	ELECT 2,200 16V
C21	1-123-338-00	ELECT 2,200 25V
C22	1-108-611-00	MYLAR 0.22 10% 100V
C25	1-108-611-00	MYLAR 0.22 10% 100V
C26	1-108-603-00	MYLAR 0.1 10% 100V
C27	1-108-603-00	MYLAR 0.1 10% 100V
C30	1-108-389-00	MYLAR 0.1 5% 100V
C31	1-108-389-00	MYLAR 0.1 5% 100V
C32	1-108-389-00	MYLAR 0.1 5% 100V
C33	1-108-389-00	MYLAR 0.1 5% 100V
CN104	1-560-033-00	PIN, 3P
CN105	1-560-033-00	PIN, 3P
CN106	1-560-033-00	PIN, 3P
CN107	1-560-033-00	PIN, 3P
D1	8-719-510-10	S1RB10
D2	8-719-510-10	S1RB10
D3	8-719-162-07	RD6.2E-B
D4	8-719-801-51	S5151R
D5	8-719-851-51	S5151
D6	8-719-162-07	RD6.2E-B
D7	8-719-801-51	S5151R
D8	8-719-851-51	S5151
D9	8-719-143-07	RD4.3E-B
D12	8-719-911-55	UO5G
D13	8-719-911-55	UO5G
D14	8-719-911-55	UO5G
D15	8-719-911-55	UO5G
D16	8-719-151-07	RD5.1E-B

NOTE:

1. **The shaded and ⚠-marked components are critical to safety.**
   Replace only with same components as specified.

2. Parts printed in **Bold-Face type** are normally stocked for replacement purposes. The remaining parts shown in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.

Ref. No.	Parts No.	Description
⚠F1	1-532-078-00	1A TIME LAG
⚠F2	1-532-237-00	3.15A TIME LAG
⚠F3	1-532-350-00	4A TIME LAG
⚠F4	1-532-237-00	3.15A TIME LAG
⚠F5	1-532-350-00	4A TIME LAG
⚠F6	1-532-285-00	1.25A TIME LAG
⚠F7	1-532-285-00	1.25 TIME LAG
⚠F8	1-532-350-00	4A TIME LAG
⚠F9	1-532-259-00	1.6A TIME LAG
⚠F10	1-532-299-00	5A TIME LAG
Q1	8-760-413-10	2SC1475
Q2	8-729-663-47	2SC1364
Q3	8-729-663-47	2SC1364
Q4	8-760-413-10	2SC1475
Q5	8-729-663-47	2SC1364
Q6	8-760-413-10	2SC1475
Q7	8-729-663-47	2SC1364
Q8	8-729-468-43	2SA684
Q9	8-729-663-47	2SC1364
R2	1-244-881-00	CARBON 2.2K 1/2W 5%
R6	1-244-248-XX	VAR, 470
⚠R8	1-207-639-00	WIREWOUND 330 2W 10%
R10	1-244-881-00	CARBON 2.2 1/2W 5%
R16	1-224-248-XX	VAR, 470

Ref. No.	Parts No.	Description
R22	1-224-248-XX	VAR, 470
⚠R26	1-217-397-00	FUSE 68 1/4W 5%
R28	1-213-144-00	METAL 1.2K 1W 5%

RL-5 BOARD

⚠	1-600-037-00	PRINTED WIRING BOARD, RL-5
	1-533-037-XX	HOLDER, FUSE
⚠F1	1-532-284-00	0.63A TIME LAG

RL-7 BOARD

	1-600-384-00	PRINTED WIRING BOARD, RL-7
D1	8-719-815-55	1S1555
D2	8-719-815-55	1S1555
D3	8-719-815-55	1S1555
D4	8-719-815-55	1S1555
Q1	8-729-663-47	2SC1364

NOTE:

1. **The shaded and ⚠-marked components are critical to safety.**
   Replace only with same components as specified.

2. Parts printed in **Bold-Face type** are normally stocked for replacement purposes. The remaining parts shwon in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.

Ref. No.	Parts No.	Description
RP-2A BOARD		
⚠	A-6711-121-B	MOUNTED BOARD, RP-2A
C32	1-108-595-00	MYLAR 0.047 5% 50V
C37	1-108-587-00	MYLAR 0.022 5% 50V
C40	1-108-589-00	MYLAR 0.027 5% 50V
C41	1-108-579-00	MYLAR 0.01 5% 50V
C44	1-108-595-00	MYLAR 0.047 5% 50V
C61	1-108-579-00	MYLAR 0.01 5% 50V
C64	1-131-195-00	TANTALUM 33 10% 10V
C67	1-131-195-00	TANTALUM 33 10% 10V
C69	1-131-195-00	TANTALUM 33 10% 10V
C70	1-131-195-00	TANTALUM 33 10% 10V
C76	1-108-567-00	MYLAR 0.0033 5% 50V
C77	1-108-579-00	MYLAR 0.01 5% 50V
C80	1-108-579-00	MYLAR 0.01 5% 50V
C87	1-108-579-00	MYLAR 0.01 5% 50V
C92	1-131-216-00	TANTALUM 1.5 10% 35V
C93	1-108-579-00	MYLAR 0.01 5% 50V
CV1	1-141-167-00	TRIMMER 18PF
CV2	1-141-167-00	TRIMMER 18PF
D1	8-719-815-55	1S1555
D2	8-719-815-55	1S1555
D3	8-719-815-55	1S1555
D4	8-719-815-55	1S1555
D5	8-719-815-55	1S1555
DL1	1-415-092-00	1H
IC1	8-751-340-00	CX-134A (SONY)
IC2	8-751-300-00	CX-130 (SONY)
IC3	8-751-300-00	CX-130 (SONY)

Ref. No.	Parts No.	Description
L5	1-107-291-00	VAR, 15mH
L17	1-407-572-00	VAR, 33
L18	1-407-572-00	VAR, 33
Q14	8-729-663-47	2SC1364
Q15	8-724-375-01	2SC403C
Q16	8-724-375-01	2SC403C
Q17	8-724-375-01	2SC403C
Q18	8-724-375-01	2SC403C
Q19	8-724-375-01	2SC403C
Q20	8-724-375-01	2SC403C
Q21	8-724-375-01	2SC403C
Q22	8-724-375-01	2SC403C
Q23	8-724-375-01	2SC403C
Q24	8-724-375-01	2SC403C
Q25	8-724-375-01	2SC403C
Q26	8-723-305-00	2SK43-5
Q27	8-723-305-00	2SK43-5
Q28	8-729-663-47	2SC1364
Q31	8-724-375-01	2SC403C
⚠R52	1-207-636-00	WIREWOUND 100 2W 10%
⚠R62	1-207-636-00	WIREWOUND 100 2W 10%
⚠R87	1-211-933-00	CARBON 47 1/8W 5%
⚠R101	1-207-632-00	WIREWOUND 47 2W 10%
⚠R134	1-211-498-00	CARBON 10 1/4W 5%
RV4	1-224-251-XX	VAR, 4.7K
RV5	1-224-253-XX	VAR, 22K
RV6	1-224-253-XX	VAR, 22K
RV7	1-224-250-XX	VAR, 2.2K

NOTE:

1. **The shaded and ⚠-marked components are critical to safety.**
   Replace only with same components as specified.

2. Parts printed in **Bold-Face type** are normally stocked for replacement purposes. The remaining parts shown in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.

Ref. No.	Parts No.	Description
RV8	**1-224-250-XX**	**VAR, 2.2K**
RV9	**1-224-249-XX**	**VAR, 1K**
RV10	**1-224-250-XX**	**VAR, 2.2K**
RV11	**1-224-251-XX**	**VAR, 4.7K**
RV12	**1-224-251-XX**	**VAR, 4.7K**
T1	**1-425-724-00**	**HIGH FREQ**
T2	**1-425-724-00**	**HIGH FREQ**

SA-1-3 BOARD

	1-584-413-00	PRINTED WIRING BOARD, SA-1
C101	**1-119-162-00**	**ELECT 10 25V**
C102	**1-119-162-00**	**ELECT 10 25V**
C103	**1-119-162-00**	**ELECT 10 25V**
C104	**1-119-162-00**	**ELECT 10 25V**
C105	**1-119-162-00**	**ELECT 10 25V**
Q101	**8-729-663-47**	**2SC1364**
SW1	**1-516-462-00**	**LEVER ROCKER "AUDIO MONITOR"**
SW2	**1-516-462-00**	**LEVER ROCKER "PGM'ED OPERATION"**
T1	**1-427-284-00**	**OUTPUT**
T2	**1-427-284-00**	**OUTPUT**

SC-20 BOARD

	1-586-528-00	PRINTED WIRING BOARD, SC-20
S3	**1-516-518-00**	**ROTARY "SYSTEM SELECT"**

Ref. No.	Parts No.	Description
SI-4 BOARD		
	1-586-522-00	PRINTED WIRING BOARD, SI-4
⚠C1	**1-130-159-00**	**METALIZED FILM 0.047 250V**
⚠R1	**1-213-132-00**	**METAL 120 1W 5%**

SL-3-2 BOARD

	1-588-130-00	PRINTED WIRING BOARD, SL-3
D1	**8-719-200-02**	**10E-2**
D2	**8-719-200-02**	**10E-2**
D3	**8-719-200-02**	**10E-2**
D4	**8-719-200-02**	**10E-2**
D5	**8-719-200-02**	**10E-2**
D6	**8-719-200-02**	**10E-2**
D7	**8-719-200-02**	**10E-2**
D8	**8-719-815-55**	**1S1555**
D11	**8-719-162-77**	**RD6.2E-C**
Q1	**8-729-663-47**	**2SC1364**
Q2	**8-729-663-47**	**2SC1364**
Q3	**8-729-663-47**	**2SC1364**
Q4	**8-729-663-47**	**2SC1364**
Q5	**8-729-317-12**	**2SA671**
Q6	**8-729-468-43**	**2SA684**
Q7	**8-729-316-12**	**2SC1061**
Q8	**8-760-413-10**	**2SC1475**
Q9	**8-729-612-77**	**2SA1027R**
⚠R1	**1-207-657-00**	**WIREWOUND 10 3W 10%**

NOTE:

1. **The shaded and ⚠-marked components are critical to safety.**
   Replace only with same components as specified.

2. Parts printed in **Bold-Face type** are normally stocked for replacement purposes. The remaining parts shown in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.

Ref. No.	Parts No.	Description
SV-10A BOARD		
⚠	A-6715-048-B	MOUNTED BOARD, SV-10A
C1	1-108-587-00	MYLAR 0.022 5% 50V
C2	1-108-587-00	MYLAR 0.022 5% 50V
C3	1-108-591-00	MYLAR 0.033 5% 50V
C4	1-108-591-00	MYLAR 0.033 5% 50V
C5	1-108-575-00	MYLAR 0.0068 5% 50V
C6	1-108-593-00	MYLAR 0.039 5% 50V
C7	1-108-595-00	MYLAR 0.047 5% 50V
C8	1-129-879-00	PLASTIC FILM 0.047 5% 50V
C10	1-129-879-00	PLASTIC FILM 0.047 5% 50V
C11	1-129-879-00	PLASTIC FILM 0.047 5% 50V
C12	1-129-879-00	PLASTIC FILM 0.047 5% 50V
C13	1-108-599-00	MYLAR 0.068 5% 50V
C14	1-131-213-00	TANTALUM 0.47 10% 35V
C15	1-108-555-00	MYLAR 0.001 5% 50V
C16	1-108-591-00	MYLAR 0.033 5% 50V
C17	1-108-591-00	MYLAR 0.033 5% 50V
C20	1-121-806-00	NON-POLAR ELECT 10 20% 16V
C22	1-131-209-00	TANTALUM 0.1 10% 35V
C23	1-108-579-00	MYLAR 0.01 5% 50V
C26	1-131-209-00	TANTALUM 0.1 10% 35V
C27	1-108-579-00	MYLAR 0.01 5% 50V
C29	1-108-575-00	MYLAR 0.0068 5% 50V
C30	1-108-593-00	MYLAR 0.039 5% 50V
C31	1-131-213-00	TANTALUM 0.47 10% 35V
C36	1-108-583-00	MYLAR 0.015 5% 50V
C37	1-108-567-00	MYLAR 0.0033 5% 50V
C38	1-108-601-00	MYLAR 0.082 5% 50V
C39	1-108-555-00	MYLAR 0.001 5% 50V
C40	1-108-595-00	MYLAR 0.047 5% 50V
C41	1-108-591-00	MYLAR 0.033 5% 50V
C47	1-131-213-00	TANTALUM 0.47 10% 35V
C49	1-108-601-00	MYLAR 0.082 5% 50V
C50	1-108-579-00	MYLAR 0.01 5% 50V
C56	1-131-212-00	TANTALUM 0.33 10% 35V
C58	1-131-211-00	TANTALUM 0.22 10% 35V
C62	1-108-579-00	MYLAR 0.01 5% 50V
C63	1-108-579-00	MYLAR 0.01 5% 50V

Ref. No.	Parts No.	Description
C65	1-108-555-00	MYLAR 0.001 5% 50V
C66	1-108-555-00	MYLAR 0.001 5% 50V
C67	1-131-212-00	TANTALUM 0.33 10% 35V
C68	1-108-575-00	MYLAR 0.0068 5% 50V
C72	1-108-599-00	MYLAR 0.068 5% 50V
C501	1-108-591-00	MYLAR 0.033 5% 50V
C502	1-108-555-00	MYLAR 0.001 5% 50V
C503	1-108-591-00	MYLAR 0.033 5% 50V
C504	1-108-591-00	MYLAR 0.033 5% 50V
C601	1-108-567-00	MYLAR 0.0033 5% 50V
C602	1-108-563-00	MYLAR 0.0022 5% 50V
C605	1-108-595-00	MYLAR 0.047 5% 50V
D1	8-719-815-55	1S1555
D2	8-719-815-55	1S1555
D3	8-719-815-55	1S1555
D5	8-719-156-07	RD5.6E-B
D9	8-719-815-55	1S1555
D10	8-719-815-55	1S1555
D11	8-719-815-55	1S1555
D501	8-719-911-55	UO5G
D601	8-719-815-55	1S1555
D602	8-719-815-55	1S1555
D603	8-719-815-55	1S1555
D604	8-719-815-55	1S1555
IC1	8-751-380-00	CX-138 (SONY)
IC2	8-751-430-00	CX-143A (SONY)
IC3	8-759-430-10	AN301 (PANASONIC)
IC4	8-759-374-58	HA17458GS (HITACHI)
IC5	8-759-374-58	HA17458GS (HITACHI)
IC601	8-759-240-11	TC4011BP, C-MOS (CD4011BE ; RCA)
Q1	8-729-663-47	2SC1364
Q2	8-729-663-47	2SC1364
Q3	8-729-612-77	2SA1027R
Q5	8-729-663-47	2SC1364
Q6	8-729-663-47	2SC1364
Q7	8-729-663-47	2SC1364
Q10	8-729-663-47	2SC1364
Q11	8-729-663-47	2SC1364
Q12	8-729-612-77	2SA1027R

NOTE:

1. **The shaded and ⚠-marked components are critical to safety.**
   Replace only with same components as specified.

2. Parts printed in **Bold-Face type** are normally stocked for replacement purposes. The remaining parts shown in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.

Ref. No.	Parts No.	Description
Q13	8-729-663-47	2SC1364
Q15	8-729-663-47	2SC1364
Q16	8-729-612-77	2SA1027R
Q17	8-729-663-47	2SC1364
Q18	8-729-612-77	2SA1027R
Q20	8-729-663-47	2SC1364
Q21	8-729-612-77	2SA1027R
Q22	8-723-303-20	2SK43-3
Q25	8-729-663-47	2SC1364
Q26	8-729-663-47	2SC1364
Q27	8-729-663-47	2SC1364
Q29	8-729-663-47	2SC1364
Q30	8-729-663-47	2SC1364
Q501	8-729-663-47	2SC1364
Q502	8-729-317-12	2SA671TD
Q601	8-729-663-47	2SC1364
R5	1-212-692-00	METAL 39K 1/2W 1%
R10	1-212-695-00	METAL 51K 1/2W 1%
R11	1-212-692-00	METAL 39K 1/2W 1%
R12	1-212-684-00	METAL 18K 1/2W 1%
R19	1-212-686-00	METAL 22K 1/2W 1%
R44	1-212-709-00	METAL 200K 1/2W 1%
R80	1-244-866-00	CARBON 510 1/2W 5%
⚠R95	1-213-135-00	METAL 220 1W 5%
R99	1-212-694-00	METAL 47K 1/2W 1%
⚠R501	1-207-621-00	WIREWOUND 1.5 2W 10%
RV1	1-224-254-XX	VAR, 47K
RV2	1-224-253-XX	VAR, 22K
RV4	1-224-255-XX	VAR, 100K
RV5	1-224-253-XX	VAR, 22K
RV6	1-224-253-XX	VAR, 22K
RV7	1-224-254-XX	VAR, 47K
RV8	1-224-256-XX	VAR, 220K
RV9	1-224-254-XX	VAR, 47K
RV601	1-224-256-XX	VAR, 220K

Ref. No.	Parts No.	Description
SY-46-4 BOARD		
	⚠A-6717-130-A	MOUNTED BOARD, SY-46-4
C2	1-131-192-00	TANTALUM 4.7 10% 10V
C3	1-102-106-00	CERAMIC 100PF 10% 50V
C4	1-108-603-00	MYLAR 0.1 5% 50V
C6	1-131-210-00	TANTALUM 0.15 10% 35V
C7	1-131-232-00	TANTALUM 4.7 10% 16V
C10	1-108-603-00	MYLAR 0.1 5% 50V
C21	1-131-191-00	TANTALUM 47 10% 6.3V
C22	1-131-217-00	TANTALUM 2.2 10% 35V
C25	1-131-211-00	TANTALUM 0.22 10% 35V
C26	1-131-191-00	TANTALUM 47 10% 6.3V
C27	1-131-191-00	TANTALUM 47 10% 6.3V
C31	1-108-591-00	MYLAR 0.033 5% 50V
C32	1-108-591-00	MYLAR 0.033 5% 50V
C33	1-131-218-00	TANTALUM 3.3 10% 35V
C35	1-102-114-00	CERAMIC 470PF 10% 50V
C36	1-102-114-00	CERAMIC 470PF 10% 50V
C37	1-131-217-00	TANTALUM 2.2 10% 35V
C38	1-131-199-00	TANTALUM 10 10% 16V
C39	1-102-114-00	CERAMIC 470PF 10% 50V
C40	1-102-114-00	CERAMIC 470PF 10% 50V
C41	1-129-701-00	POLYPROPYLENE 0.01 5% 100V
C43	1-129-701-00	POLYPROPYLENE 0.01 5% 100V
C46	1-108-603-00	MYLAR 0.1 5% 50V
C47	1-108-603-00	MYLAR 0.1 5% 50V
C48	1-131-217-00	TANTALUM 2.2 10% 35V
C49	1-131-215-00	TANTALUM 1 10% 35V
C50	1-131-200-00	TANTALUM 15 10% 16V
C101	1-131-217-00	TANTALUM 2.2 10% 35V
C111	1-131-201-00	TANTALUM 22 10% 16V
C117	1-131-199-00	TANTALUM 10 10% 16V
D1	8-719-200-02	10E-2
D2	8-719-200-02	10E-2
D3	8-719-200-02	10E-2
D4	8-719-200-02	10E-2
D5	8-719-200-02	10E-2
D6	8-719-200-02	10E-2
D7	8-719-815-55	1S1555
D8	8-719-815-55	1S1555
D9	8-719-815-55	1S1555
D10	8-719-815-55	1S1555

NOTE:

1. **The shaded and ⚠-marked components are critical to safety.**
   Replace only with same components as specified.

2. Parts printed in **Bold-Face type** are normally stocked for replacement purposes. The remaining parts shown in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.

Ref. No.	Parts No.	Description
D11	8-719-815-55	1S1555
D12	8-719-815-55	1S1555
D13	8-719-200-02	10E-2
D14	8-719-200-02	10E-2
D15	8-719-200-02	10E-2
D16	8-719-815-55	1S1555
D17	8-719-815-55	1S1555
D18	8-719-815-55	1S1555
D19	8-719-815-55	1S1555
D20	8-719-815-55	1S1555
D21	8-719-815-55	1S1555
D22	8-719-815-55	1S1555
D23	8-719-815-55	1S1555
D24	8-719-815-55	1S1555
D25	8-719-815-55	1S1555
D26	8-719-815-55	1S1555
D27	8-719-815-55	1S1555
D28	8-719-815-55	1S1555
D29	8-719-815-55	1S1555
D30	8-719-815-55	1S1555
D31	8-719-815-55	1S1555
D32	8-719-815-55	1S1555
D33	8-719-815-55	1S1555
D34	8-719-815-55	1S1555
D35	8-719-815-55	1S1555
D36	8-719-815-55	1S1555
D37	8-719-815-55	1S1555
D38	8-719-815-55	1S1555
D39	8-719-815-55	1S1555
D40	8-719-815-55	1S1555
D41	8-719-815-55	1S1555
D42	8-719-815-55	1S1555
D43	8-719-815-55	1S1555
D44	8-719-815-55	1S1555
D45	8-719-815-55	1S1555
D46	8-719-815-55	1S1555
D47	8-719-815-55	1S1555
D48	8-719-815-55	1S1555
D49	8-719-815-55	1S1555
D50	8-719-815-55	1S1555
D51	8-719-815-55	1S1555
D52	8-719-815-55	1S1555
D53	8-719-815-55	1S1555
D54	8-719-815-55	1S1555
D55	8-719-815-55	1S1555

Ref. No.	Parts No.	Description
D56	8-719-815-55	1S1555
D57	8-719-815-55	1S1555
D58	8-719-815-55	1S1555
D59	8-719-815-55	1S1555
D60	8-719-815-55	1S1555
D61	8-719-815-55	1S1555
D62	8-719-815-55	1S1555
D63	8-719-815-55	1S1555
D64	8-719-815-55	1S1555
D65	8-719-815-55	1S1555
D66	8-719-815-55	1S1555
D67	8-719-815-55	1S1555
D68	8-719-815-55	1S1555
D101	8-719-815-55	1S1555
D102	8-719-815-55	1S1555
D103	8-719-815-55	1S1555
D104	8-719-815-55	1S1555
D105	8-719-815-55	1S1555
D106	8-719-815-55	1S1555
D107	8-719-815-55	1S1555
D151	8-719-815-55	1S1555
D152	8-719-815-55	1S1555
IC1	8-757-561-00	CX-756A (SONY)
IC2	8-757-570-00	CX-757 (SONY)
IC3	8-759-308-07	HA1807 (HITACHI)
IC4	8-759-240-11	TC4011BP, C-MOS (CD4011 BE; RCA)
IC5	8-759-904-69	MSM4069, C-MOS (CD4069 BE; RCA)
IC6	8-759-240-11	TC4011BP, C-MOS (CD4011 BE; RCA)
IC7	8-759-140-01	μPD4001C, C-MOS (CD4001 BE; RCA)
IC8	8-759-240-11	TC4011BP, C-MOS (CD4011 BE; RCA)
IC9	8-759-240-71	TC4071BP, C-MOS (CD4071 BE; RCA)
IC10	8-759-140-01	μPD4001C, C-MOS (CD4001 BE; RCA)
IC11	8-759-271-20	TA7120P (TOSHIBA)
IC12	8-759-240-11	TC4011BP, C-MOS (CD4011BE; RCA)
Q1	8-729-663-47	2SC1364
Q2	8-729-663-47	2SC1364
Q3	8-760-523-10	2SA772
Q4	8-760-523-10	2SA772
Q5	8-760-335-10	2SC1474
Q6	8-760-335-10	2SC1474
Q7	8-729-663-47	2SC1364
Q8	8-729-663-47	2SC1364
Q9	8-729-663-47	2SC1364
Q10	8-729-663-47	2SC1364

NOTE:

1. **The shaded and ⚠-marked components are critical to safety.**
   Replace only with same components as specified.

2. Parts printed in **Bold-Face type** are normally stocked for replacement purposes. The remaining parts shown in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.

SY-46-4/FRAME

Ref. No.	Parts No.	Description
Q11	8-729-663-47	2SC1364
Q12	8-729-663-47	2SC1364
Q13	8-760-413-10	2SC1475
Q14	8-729-331-53	2SC2315
Q15	8-729-663-47	2SC1364
Q16	8-729-663-47	2SC1364
Q17	8-729-663-47	2SC1364
Q18	8-729-612-77	2SA1027R
Q19	8-729-317-12	2SA671
Q20	8-729-612-77	2SA1027R
Q21	8-729-316-12	2SA684
Q22	8-729-663-47	2SC1364
Q23	8-729-663-47	2SC1364
Q24	8-729-663-47	2SC1364
Q25	8-729-663-47	2SC1364
Q26	8-729-663-47	2SC1364
Q27	8-729-663-47	2SC1364
Q28	8-729-663-47	2SC1364
Q29	8-729-663-47	2SC1364
Q30	8-729-663-47	2SC1364
Q31	8-729-663-47	2SC1364
Q32	8-760-335-10	2SC1474
Q33	8-729-663-47	2SC1364
Q34	8-729-663-47	2SC1364
Q35	8-729-663-47	2SC1364
Q36	8-729-663-47	2SC1364
Q37	8-729-663-47	2SC1364
Q38	8-729-663-47	2SC1364
Q39	8-729-663-47	2SC1364
Q40	8-729-663-47	2SC1364
Q41	8-729-663-47	2SC1364
Q42	8-729-663-47	2SC1364
Q43	8-729-663-47	2SC1364
Q44	8-729-663-47	2SC1364
Q45	8-729-663-47	2SC1364
Q46	8-729-663-47	2SC1364
Q47	8-729-663-47	2SC1364
Q48	8-729-663-47	2SC1364
Q49	8-729-663-47	2SC1364
Q50	8-729-663-47	2SC1364
Q101	8-729-612-77	2SA1027R
Q102	8-729-663-47	2SC1364
Q103	8-729-663-47	2SC1364
Q104	8-729-662-47	2SC1364

Ref. No.	Parts No.	Description
R140	1-244-829-00	CARBON 15 1/2W 5%
⚠ R163	1-217-212-00	WIREWOUND 10 2W 10%
⚠ R164	1-217-212-00	WIREWOUND 10 2W 10%
⚠ R165	1-217-212-00	WIREWOUND 10 2W 10%

FRAME (REF. NO. 40,000 SERIES)

1-509-437-00	SOCKET, TRANSISTOR (FOR 2SC1115)
1-517-075-00	SOCKET, LAMP "PHOTO"
1-526-559-00	SOCKET, TRANSISTOR (FOR 2SD257)
⚠ 1-533-148-00	HOLDER, FUSE (CONNECTOR PANEL)
⚠ 1-536-476-00	TERMINAL, 4P
⚠ 1-552-331-00	SELECTOR, VOLTAGE
1-586-633-00	"CONDENSATION SENSOR"

⚠ C1	1-130-160-00	METALIZED FILM 0.22 250V
⚠ C2	1-130-194-00	METALIZED FILM 2.5+1.2 300V
C3	1-108-579-00	MYLAR 0.01 5% 50V
⚠ CN1	1-509-546-00	RECEPTACLE, 3P, MALE "AC IN"
CN5	1-509-095-00	RECEPTACLE, 8P, FEMALE "TV"
CN6	1-509-142-XX	JACK, PIN "LINE OUT"
CN7	1-507-251-XX	JACK, JM-35, M-10 "AUDIO MONITOR"
CN8	1-509-891-00	RECEPTACLE, BNC "VIDEO OUT"
CN9	1-561-045-00	RECEPTACLE, 7P, FEMALE "DUB OUT"
CN10	1-560-002-00	STANDARD AERIAL "RF OUT"
CN11	1-507-449-00	JACK, JM-60, M-13S "HEADPHONES"
CN14	1-509-734-00	RECEPTACLE, 20P, FEMALE "REMOTE"
CN15	1-509-886-00	PCB CONNECTOR "RF OUT"

NOTE:

1. **The shaded and ⚠-marked components are critical to safety.**
   Replace only with same components as specified.

2. Parts printed in **Bold-Face type** are normally stocked for replacement purposes. The remaining parts shown in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.

⚠F1	1-532-286-00	2.5A TIME LAG
H1	A-6709-136-A	RV-5 "UPPER DRUM ASS'Y"
H2	8-829-358-10	PP150-5803 "AUDIO/CTL"
H4	8-829-371-00	PP171-5802C "CTL PB"
⚠M1	8-839-018-10	HCS-1134A2 "AC"
M2	A-6709-131-A	RD-32 "DRUM ASS'Y"
PL1	1-518-224-00	14V 80mA "POWER"
PL6	1-518-263-00	23V 130mA "PHOTO"
PM1	1-454-127-00	"MAIN"
PM2	1-454-127-00	"PINCH"
PM3	1-454-125-00	"IDLER"
PM4	1-454-151-00	"FF"
PM5	1-454-151-00	"PLAY"
PM6	1-454-151-00	"REW"
PM7	1-454-151-00	"EJECT"
Q1	8-765-290-02	2SC2072-2 "T PHOTO TR"
Q2	8-765-290-02	2SC2072-2 "S PHOTO TR"
Q3	8-729-311-51	2SC1115
Q4	8-729-311-51	2SC1115
Q5	8-729-311-51	2SC1115
Q6	8-729-325-76	2SD257
Q7	8-729-311-51	2SC1115
R1	1-224-665-00	VAR, 500 (B) "COLOUR LOCK"
R2	1-224-720-00	VAR, 100K (B) "TRACKING"
S3	1-516-520-00	MICRO "CASSETTE IN"
S4	1-516-028-XX	MICRO "CASSETTE UP"
S5	1-552-183-00	MICRO "NORMAL UNTHREADING END"
S6	1-552-183-00	MICRO "THREADING END"
S7	1-552-183-00	MICRO "FR UNTHREADING END"
S8	1-516-028-XX	MICRO "UNTHREADING SLACK"
⚠S10	1-514-423-21	MICRO "AC MOTOR"
⚠S12	1-552-206-00	PUSH "POWER"
S13	1-548-514-XX	"TAPE COUNTER"
S15	1-516-779-XX	SLIDE "MONITOR SELECT"
⚠T1	1-442-994-00	POWER (FOR "AEP/UK")
	1-446-265-00	POWER (FOR "E")

NOTE:

1. **The shaded and ⚠-marked components are critical to safety.**
   Replace only with same components as specified.

2. Parts printed in **Bold-Face type** are normally stocked for replacement purposes. The remaining parts shown in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.

13-4. PACKING MATERIAL AND ACCESSORY

Ref. No.	Parts No.	Description
	1-534-392-00	**8 PIN CONNECTOR (FOR E)**
	⚠1-534-698-XX	**CORD, POWER (FOR AEP/E)**
	⚠1-534-819-00	**CORD, POWER (FOR UK)**
	1-551-513-00	CABLE, COAXIAL ASS'Y (FOR E)
	1-552-443-11	ANS-30 (FOR E)
	3-632-287-00	**BAG, POLY (FOR VP-2031)**
	3-648-124-02	COVER, DUST
	3-649-276-00	CUSHION (R), UPPER
	3-649-426-00	CUSHION (A), LOWER
	3-649-427-00	CUSHION (B), LOWER
	3-649-429-00	CUSHION (L), UPPER
	3-655-443-00	SPACER
	3-655-516-00	CARTON, INDIVIDUAL (FOR AEP/UK)
	3-655-517-00	CARTON, INDIVIDUAL (FOR E)
	3-701-631-00	**BAG, POLY (FOR MANUAL)**
	⚠3-770-922-11	**MANUAL, INSTRUCTION**
	3-794-175-13	**CARD, INSTRUCTION (FRENCH) (FOR AEP)**

13-5. JIG

Ref. No.	Parts No.	Description
	J-600-182-0A	**DRUM ECCENTRICITY GAUGE (3)**
	J-600-183-0A	**DRUM ECCENTRICITY GAUGE (2)**
	J-600-184-0A	**DRUM ECCENTRICITY GAUGE (1)**
	J-600-193-0A	**DRUM ECCENTRICITY GAUGE (4)**
	J-600-229-0A	**DIHEDRAL ADJUSTING SCREW**
	J-600-906-0A	**SCREWDRIVER WITH GEAR**
	J-6001-085-A	**PINCH LEVER ADJUSTMENT JIG**
	Y-2031-001-0	**CLEANING FLUID**
	2-034-697-00	**CHAMOIS**
	3-702-213-01	**38MM DIA TORQUE MEASUREMENT TAPE**
	3-702-215-01	**100MM DIA TORQUE MEASUREMENT TAPE**
	3-702-216-01	**BACK TENSION ADJUSTMENTS JIG**
	3-702-390-01	**ECCENTRIC SCREWDRIVER (4φ)**
	3-702-391-01	**ECCENTRIC SCREWDRIVER (5φ)**
	3-702-394-01	**FWD BACK TENSION MEASUREMENT JIG**
	3-702-397-01	**REEL TABLE HEIGHT ADJ. JIG**
	3-702-398-01	**POSITION JIG**
	7-732-050-20	**TENSION SCALE (50G FULL SCALE)**
	7-732-050-30	**TENSION SCALE (100G FULL SCALE)**
	7-732-050-40	**TENSION SCALE (200G FULL SCALE)**
	7-732-050-50	**TENSION SCALE (500G FULL SCALE)**
	8-960-014-87	**ALIGNMENT TAPE RR47S SECAM COLOUR-BAR**
	8-960-015-01	**ALIGNMENT TAPE RR51S, NTSC**
	8-960-015-61	**ALIGNMENT TAPE RR51S, PAL**
	9-911-053-00	**THICKNESS GAUGE**
	STANDARD PRODUCTS	HEAD DEMAGNETIZER HE-2 OR HE-3
	STANDARD PRODUCTS	VIDEO CASSETTE TAPE (KCA-60)

NOTE:

1. **The shaded and ⚠-marked components are critical to safety.**
   Replace only with same components as specified.

2. Parts printed in **Bold-Face type** are normally stocked for replacement purposes. The remaining parts shown in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.